106th Congress, 2d Session – – – – – – – – – – – – – House Document 106–185

HARBOR IMPROVEMENTS—FINAL INTERIM FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT, SAND POINT, ALASKA

COMMUNICATION

FROM

ASSISTANT SECRETARY OF THE ARMY

TRANSMITTING

A LETTER FROM THE CHIEF OF ENGINEERS, DEPARTMENT OF THE ARMY DATED OCTOBER 13, 1996, SUBMITTING A REPORT WITH ACCOMPANYING PAPERS AND ILLUSTRATIONS

FEBRUARY 1, 2000.—Referred to the Committee on Transportation and Infrastructure and ordered to be printed

106th Congress, 2d Session – – – – – – – – – – – – – House Document 106–185

HARBOR IMPROVEMENTS—FINAL INTERIM FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT, SAND POINT, ALASKA

COMMUNICATION

FROM

ASSISTANT SECRETARY OF THE ARMY

TRANSMITTING

A LETTER FROM THE CHIEF OF ENGINEERS, DEPARTMENT OF THE ARMY DATED OCTOBER 13, 1996, SUBMITTING A REPORT WITH ACCOMPANYING PAPERS AND ILLUSTRATIONS

FEBRUARY 1, 2000.—Referred to the Committee on Transportation and Infrastructure and ordered to be printed

---

U.S. GOVERNMENT PRINTING OFFICE
62–244 WASHINGTON : 2000

CONTENTS

FIGURES

TABLES

ENVIRONMENTAL DOCUMENTS

FINDING OF NO SIGNIFICANT IMPACT AND ENVIRONMENTAL ASSESSMENT (EA)

APPENDIXES

LETTER OF TRANSMITTAL

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
CIVIL WORKS
108 ARMY PENTAGON
WASHINGTON DC 20310-0108
0 2 DEC 1999

REPLY TO
ATTENTION OF

Honorable J. Dennis Hastert
Speaker of the House
of Representatives
Washington, D.C. 20515

Dear Mr. Speaker:

Section 101 (a) (2) of the Water Resources Development Act (WRDA) of 1999 authorized navigation improvements at Sand Point Harbor, Alaska. The proposal is described in the report of the Chief of Engineers dated October 13, 1998, which includes other pertinent reports and documents. The Secretary of the Army supports the authorization and subject to a modification in project scope, revised cost sharing, and an additional non-Federal operation requirement, all noted in this report, plans to implement the project through the normal budget process.

I am submitting this report in partial response to a resolution adopted by the House Committee on Public Works on December 2, 1970. The views of the State of Alaska, the Departments of the Interior and Transportation, and the Environmental Protection Agency are set forth in the enclosed report.

The authorized project maximizes net national economic development benefits consistent with environmental quality, and consists of constructing a new harbor adjacent and south of the existing Humboldt Harbor, at Sand Point, Alaska. The Humboldt Harbor is a federally constructed facility. A 570-foot extension would be added to the southern breakwater of the existing harbor to form the northwest side of the new moorage basin and the eastern side of the new entrance channel. An additional breakwater, 730 feet long, would be constructed further south to create a protected entrance channel and an 8.6-acre moorage basin and maneuvering area. Both rubblemound breakwaters would have a crest elevation of 16 feet above mean lower low water (MLLW). The entrance channel and maneuvering area would be dredged to a depth of 18 feet below MLLW, and the mooring basin would be dredged to a depth of 17 feet below MLLW. The entrance channel would have a bottom width of 120 feet, with an additional width of 230 feet in the turn into the moorage basin. Dredged material would be disposed of in an intertidal area along the shoreline of the new basin, and used to construct a 2.7 acre storage and access area along the shoreline of the existing harbor. Dredged material would also be disposed of within the new basin at depths greater than 20 feet below MLLW. Non-Federal interests would be responsible for dredging the moorage basin itself and would provide the float system for the moorage of vessels. The proposed project would provide year-round moorage for thirty-seven large fishing vessels of from 80 to 150 feet in length, reduce vessel-operating costs, and provide a harbor of refuge.

The project would be designed and constructed in ways to avoid or minimize adverse environmental impacts, including a design with a minimum project footprint, use of silt curtains during dredging, development of a blasting plan, and minimizing the effects of disposal of dredged materials on fisheries. A separate local mitigation plan has also been developed to encourage the proper disposal of fish nets and waste engine oil, and to maintain sockeye salmon returns to spawning habitats.

Based on October 1998 price levels, the Army Corps of Engineers estimates the total first cost of the proposed project at $11,760,000, with a Federal cost of about $6,892,000, and a non-Federal cost of about $4,868,000. This cost includes $8,515,000 for general navigation features; $3,165,000 for the sponsor's dredging of the moorage basin and provision of the float system; $72,000 for lands, easements, rights-of-way, and relocations; and, $8,000 for federally provided aids to navigation. The non-Federal share noted above includes the additional 10 percent of the cost of the general navigation features required by Section 101 of the WRDA 1986.

The Secretary of the Army generally concurs in the recommendations of the Chief of Engineers, subject to several modifications as described herein. In paragraph 2 of his report, the Chief of Engineers describes the length of the extension to the southern breakwater of the existing harbor as 630 feet. However, the project developed by the reporting officers has an extension of only 570 feet, which is the recommended length. In addition, the cost sharing recommended by the Chief has bcen made to be consistent with Section 101 of WRDA 1986, as modified by Section 201 of WRDA 1996, regarding the definition of general navigation features, and the crediting for the non-Federal cost of lands, easements, rights-of-way, and relocations. The cost sharing noted above modifies that found both in the report of the Chief of Engineers, and in Section 101(a)(2) of WRDA 1999.

In paragraph 4 of his report, the Chief of Engineers describes certain non-Federal cost sharing, financing, and other provision of local cooperation. Item "4o" that relates to the non-Federal operation and maintenance of both local service facilities and dredged material disposal areas should be removed. Section 101 of WRDA 1986, as modified by Section 201 of WRDA 1996, specifies that operation and maintenance of dredged material disposal facilities is a Federal responsibility. In addition, local cooperation item "4a" satisfies the requirement that the non-Federal sponsor provide, and operate and maintain local service facilities.

The mitigation plan developed by the reporting officers and the non-Federal sponsor also includes provisions to develop and implement a program to encourage the proper disposal of fish nets, to develop a program and facilities for the proper disposal of waste engine oils, and a program for the clearing of two local anadromous fish streams twice per year for 25 years to maintain sockeye salmon returns to spawning habitats. Implementation of these measures is important to agency acceptance of the proposed project. The total cost of these measures is estimated by the Corps at $58,000 per year, and would be a non-Federal responsibility. However, the provisions of local cooperation included in the report of the Chief of Engineers do not specify that the non-Federal sponsor is responsible for these measures. Accordingly, item "4o" is replaced with the following provision:

> "o. For so long as the project is authorized, operate and maintain at its own expense, programs and facilities for the recycling and disposal of fish nets and waste oils; and, for a period not to exceed 25 years following completion of the construction of the project, clear at its own expense two local anadromous fish streams in a manner compatible with maintaining sockeye salmon returns for spawning, and in accordance with applicable Federal and State laws and regulations, and any specific directions prescribed by the Federal Government;"

The Office of Management and Budget advises that there is no objection to submitting this report, as revised by the Secretary of the Army, to the Congress. A copy of its letter is enclosed in the report.

Sincerely,

Joseph W. Westphal
Assistant Secretary of the Army
(Civil Works)

COMMENTS OF THE OFFICE OF MANAGEMENT AND BUDGET

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

July 15, 1999

Honorable Joseph W. Westphal
Assistant Secretary of the Army for Civil Works
Pentagon – Room 2E570
Washington, DC 20310-0108

Dear Dr. Westphal:

As required by Executive Order 12322, the Office of Management and Budget has completed its review of your recommendation for the navigation improvements project at Sand Point Harbor, AK.

The recommendation for this project is consistent with the policies and program of the President. The Office of Management and Budget does not object to the submission of this report to Congress.

Sincerely,

Kathleen Peroff
Deputy Associate Director
Energy and Science Division

COMMENTS OF THE STATE OF ALASKA

OFFICE OF THE GOVERNOR

OFFICE OF MANAGEMENT AND BUDGET
DIVISION OF GOVERNMENTAL COORDINATION

☐ SOUTHCENTRAL REGIONAL OFFICE
3601 "C" STREET, SUITE 370
ANCHORAGE, ALASKA 99503-5930
PH: (907) 269-7470/FAX: (907) 561-6134

☑ CENTRAL OFFICE
P.O. BOX 110030
JUNEAU, ALASKA 99811-0030
PH: (907) 465-3562/FAX: (907) 465-3075

☐ PIPELINE COORDINATOR'S OFFICE
411 WEST 4TH AVENUE, SUITE 2C
ANCHORAGE, ALASKA 99501-2343
PH: (907) 271-4317/FAX: (907) 272-0690

June 25, 1998

David B. Sanford, Jr.
Chief, Policy Division
Directorate of Civil Works
U.S. Army Corps of Engineers
Washington, D.C. 20318-1000

Dear Chief Sanford:

Thank you for notifying Governor Knowles, of your proposed final report on the Sand Point Project. The State of Alaska has received the Chief of Engineers proposed report and the report of the District Engineer on the harbor construction project in Sand Point. The Division of Governmental Coordination coordinated the State's review of this project and comments were submitted to the Corps of Engineers, Alaska District, on March 23, 1998. It is our understanding that the Final Feasibility Report does not reflect any substantial changes to the project as described in the Harbor Improvements Feasibility Report and Environmental Assessment dated January, 1998, which is the document the State reviewed. Therefore, we have no additional comments to submit at this time.

Thank you for the opportunity to review the referenced report.

Sincerely,

Diane Mayer
Director

COMMENTS OF THE DEPARTMENT OF TRANSPORTATION

U.S. Department of Transportation
United States Coast Guard

Commandant
United States Coast Guard

2100 Second Street, S.W.
Washington, DC 20593-0001
Staff Symbol: G-MOR
Phone: (202) 267-0518
FAX: (202) 267-4085

16450

JUL 1 1998

Mr. David B. Sanford, Jr.
Policy Division, Policy Review Branch
Department of the Army (CECW-AR (SA))
U.S. Army Corps of Engineers
Alexandria, VA 22315-3861

Dear Mr. Sanford:

Recently you sent copies of the report on Sand Point, Alaska for the Chief of Engineers. In addition, you underscored the urgency of your review by sending a letter to the Secretary of Transportation. We have reviewed the report and related documents and have no comments to offer.

In addition, I forwarded this report to Commander, Seventeenth U.S. Coast Guard District for information purposes. Should they have any comments, they will coordinate directly with your point of contact Mr. Robert McIntyre.

Thank you for providing the Coast Guard the opportunity to review the report.

Sincerely,

L. L. HERETH
Captain, U.S. Coast Guard
Chief, Office of Response
By direction of the Commandant

COMMENTS OF THE ENVIRONMENTAL PROTECTION AGENCY

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

JUN 22 1998

Reply To
Attn Of: ECO-083

Robert McIntyre
Policy Division
Attn: CECW-AR (SA)
7701 Telegraph Rroad
Alexandria, VA 22315-3861

RE: Departmental Review: Sand Point, Alaska
Harbor Improvements Final Interim Feasibility Report and Environmental Assessment

Dear Mr. McIntyre:

The Environmental Protection Agency (EPA) has no comment to make at this time on the proposed referenced project. We do, however, regret that this project was not coordinated with the appropriate Region 10 office during the early stages of the Feasibility Study and the Environmental Assessment. We request that John Malek, Sediment Management Program, E.P.A. Region 10 be added to the mailing list for any future Corps of Engineers projects which include any dredging or filling components.

Although the Corps does not issue itself a §404 permit, it still must hold itself to the same standard as required for all permit applicants. These requirements include (1) avoidance of impacts, (2) minimization of impacts and (3) mitigation or rectifying the impact by repairing, rehabilitating, or restoring the affected environment. In the referenced project, several alternatives were investigated as possible mitigation for the fill of 18.2 acres (1000 linear ft) of nearshore and intertidal habitat. However, the clearing of 2 local anadramous streams to maintain sockeye returns for spawning does not appear to be in-kind or in-situ mitigation for the loss of a substantial area of habitat not only for salmon, but also for other benthic organisms. It is difficult to accept that a more appropriate mitigation project is not available. Again, early coordination would possibly have allowed additional input.

If, during design and construction, the proposed project is modified, EPA will reassess its current position. For further coordination, contact John Malek at (phone) 206/ 553-1286, (fax) 206/ 553-1775, or (e-mail) malek.john@epamail.epa.gov.

Sincerely,

Lee Daneker, Manager
Aquatic Resources Unit

cc: Col. Sheldon L. Jahn, Commander and District Engineer
U.S. Army Corps of Engineers
Alaska District
P.O. Box 898
Anchorage, AK 99506-0898
Attn: Bill Abadie

COMMENTS OF THE DEPARTMENT OF THE INTERIOR

United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, D.C. 20240

ER 98/361

Mr. David B. Sanford, Jr.
Chief, Policy Division
U.S. Army Corps of Engineers
ATTN: CECW-AR (SA)
7701 Telegraph Road
Alexandria, VA 22315-3861

JUL 7 1998

Dear Mr. Sanford:

The Department of the Interior has completed its review of the proposed Chief of Engineers report for Sand Point, Alaska. We have the following comments and recommendations.

The Department's Fish and Wildlife Service (FWS) has been involved with the Sand Point Small Boat Harbor project for many years. The November 1997 Final Fish and Wildlife Coordination Act Report summarized our mitigation concerns, "The Service has consistently stated that mitigation would be required to replace lost fish and wildlife resources if the Corps were to select an area of high productivity, such as Black Point [the selected alternative], as the preferred alternative." The FWS has held numerous discussions with Corps personnel and has recommended a number of off-site alternatives for mitigation. To date these recommendations have not been considered further.

The FWS has recently contacted the District Engineer expressing our serious concern that mitigation proposed by the Corps is not adequate to compensate for the permanent loss of between 18.3 and 21 acres of submerged aquatic habitat, including 7 acres of eelgrass and other aquatic vegetation (Attachment 1).

The FWS has also written the District Engineer welcoming his invitation to meet and discuss ways to promote a closer interagency working relationship between our agencies (Attachment 2). We commend the Corps of Engineers for agreeing that a mitigation plan is a necessary step in the environmental review process for civil works projects. This decision will affect planning of similar projects (e.g., building or expanding small boat harbors), which are anticipated to occur more frequently as numbers of commercial and recreational vessels continue to increase within Alaska waters.

The proposed mitigation plan identifies maintenance of a net disposal site, establishment of a waste oil recycling program, and a supporting educational program as compensatory mitigation for loss of nearshore and eelgrass habitats. These beneficial operational measures are already expected of harbor facilities under the Act to Prevent Pollution from Ships (as amended by the Marine Plastics Pollution Research and Control Act - U.S. Public Law 100-220 implementing

MARPOL Annex I and V) and the Marine Protection, Research, and Sanctuaries Act (PL 92-532 and 93-254); consequently, they are inappropriate as compensatory mitigation for this project. Additional alternative measures to address the direct loss of highly productive eelgrass and other aquatic habitats are needed.

The Sand Point Mitigation Plan proposes clearing woody debris from two streams over a 25-year period to enhance salmon production in the region. This proposal grew out of a 5-year project designed to compensate for the loss of 5 acres of wetlands and marine habitat due to a previous project - extension of the Sand Point airport runway. In a September 3, 1993, letter to Colonel Pierce, the FWS reluctantly agreed that the degree of mitigation proposed for the airport project was commensurate with the loss of this amount of acreage. The 5-year stream clearing project was intended to result in a permanent enhancement of salmon populations. Credit for stream clearing activities beyond the 5-year period would have to be based in part on any additional resource gains above and beyond those realized by the initial airport project.

The proposed plan to clear openings to John Nelson and Red Cove lakes over a 25-year period does not provide adequate compensation for the permanent loss of aquatic habitat because: 1) the scope of the proposed mitigation is not commensurate with the loss of 18 acres of prime marine aquatic habitat (by comparison two streams were only marginally acceptable for the 5-acre loss); 2) the proposed 25-year project duration is less than the life of the proposed boat harbor; 3) reports of the Aleutians East Borough (AEB) note these streams are already opened periodically by natural phenomena; 4) Borough reports note the streams are already periodically maintained by local volunteers; 5) Alaska Department of Fish and Game (ADF&G) and AEB reports note when blockages do occur, they typically do not hinder either the downstream dispersal of smolt or upstream return of spawning adult salmon; 6) the log material in these streams is part of a natural cycle contributing valuable woody debris and nutrients to the stream system; 7) the proposed mitigation is unlikely to result in dependable resource gains; ADF&G field reports note the periodic natural intrusion of salt water will reduce or eliminate any "gains" in salmon production due to clearing; and 8) there have been no follow up studies to determine if the stream clearing activities at John Nelson and Red Cove lakes have been effective at increasing salmon production.

In light of these points, we seriously question the validity of the Sand Point Mitigation Plan's assertion that clearing these streams would contribute 40,000 salmon to the fishery on a reliable and sustainable annual basis. Therefore, the FWS concludes that proposed stream clearing activities do not constitute commensurate mitigation for aquatic habitat losses due to the proposed harbor expansion.

FWS policies clearly specify the use of off-site, in-kind mitigation or off-site, out-of-kind measures when other alternatives are not feasible, not likely to succeed, or are cost prohibitive. Throughout interagency coordination on this project, the FWS has suggested a number of reasonable mitigation alternatives which we believe could provide adequate mitigation. Yet all FWS proposals, regardless of cost, were rejected. It is the FWS's firm position that mitigation measures should be identified and analyzed through the National Environmental Policy Act process and mitigation costs should be incorporated into overall project costs.

For instance, we suggested a proposal for restoring seabird populations on Dolgoi, Wosnesenski, and Deer Islands by implementing a program to eradicate introduced predators. Our analysis indicated these activities could be justified on a cost-effective basis (approximate project cost $90 K) relative to the cost of in-kind habitat replacement (estimated at >$140 K for eelgrass acreage alone). These costs are small in light of the overall cost ($11.5 M) of the Sand Point Boat Harbor Project (e.g., FWS proposed mitigation costs are only 0.8 percent of total project costs for the fox eradication proposal and 1.2 percent of project costs for habitat replacement). Additional recommended mitigation alternatives included obtaining a conservation easement or other measure to preserve eelgrass habitat on adjacent State-owned tidelands at Mud Bay and use of vertical relief structures to increase reef habitat valuable to crabs.

In recent years both the FWS and the Corps have made substantial changes to our respective policies and programs to better implement ecosystem management approaches. With respect to the FWS, a primary goal of these changes has been to better protect and enhance management of the trust resources and areas under FWS jurisdiction. The Corps has taken significant steps as well, in particular through the substantial revision of its Water Resources and Policies (EP 1165-2-1). In particular, revisions to Chapter 19, establishing procedures for ecosystem protection and restoration in navigation projects, are particularly relevant. Chapter 19 outlines opportunities for innovative resolutions of conflicts generated by projects such as Sand Point. Our agencies can and should do a better job of providing ecosystem protection throughout Alaska, primarily by development of mutually agreeable, compensatory mitigation measures.

As discussed in the recent June 2, 1998, letter we believe improved communication between our agencies could do much to alleviate serious disagreement on mitigation measures. Because mutually acceptable mitigation alternatives and their costs have not been planned to date, the FWS views economic analyses conducted in the Environmental Assessment and Interim Feasibility Report as incomplete. Thus we urge the Corps to re-examine potential mitigation proposals for inclusion in the Sand Point project upon availability of funding appropriations. Ongoing policy issues which also require discussion include anticipated location of a material site, use of quarry materials, and the impact of quarry activities related to this project.

It is our intent to work with the Corps and the Aleutians East Borough to further pursue off-site mitigation opportunities to replace near-shore habitat, including potential opportunities to use experimental restoration techniques. For further information, please contact Ann Rappoport, Field Supervisor, Anchorage Field Office, at (907) 271-2787.

Sincerely,

Terence N. Martin
for

Willie R. Taylor
Director, Office of Environmental
Policy and Compliance

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. Tudor Rd.
Anchorage, Alaska 99503-6199

ATTACHMENT 1

IN REPLY REFER TO:

AES/ESO/WAES

JUN 25 1998

Colonel Sheldon L. Jahn
District Engineer, Alaska District
U.S. Army Corps of Engineers
P.O. Box 898
Anchorage, Alaska 99501

Dear Colonel Jahn:

The Fish and Wildlife Service has reviewed the Corps of Engineers, Alaska District's April 24, 1998, letter transmitting the Public Notice, Finding of No Significant Impact, and Mitigation Plan for the proposed Sand Point Navigation Improvements Project. We also have reviewed the May 14, 1998, Division Engineer's Public Notice and "Final Interim Feasibility Report" for this project. I commend the Corps of Engineers for agreeing that a Mitigation Plan is a necessary step in the environmental review process for civil works projects. This decision will affect planning of similar projects (e.g., building or expanding small boat harbors), which are anticipated to occur more frequently as numbers of commercial and recreational vessels continue to increase within Alaska waters. However, I am concerned that the Corps considers the Mitigation Plan for the Sand Point Project as being adequate to compensate for the resources impacted. The Service does not agree with the conclusions of the FONSI and believe measures proposed by the Mitigation Plan to compensate for the permanent loss of between 18.3 and 21 acres of Submerged Aquatic Habitat, including 7 acres of eelgrass and other aquatic vegetation, are not adequate.

The Service policies clearly specify the use of off-site, in-kind mitigation or off-site, out-of-kind measures when other alternatives are not feasible, not likely to succeed, or are cost prohibitive. Throughout interagency coordination of this project, the Service has suggested a number of reasonable mitigation alternatives we believe could provide adequate mitigation. All Service mitigation proposals, regardless of cost, were rejected. It is the Service's firm position, however, that mitigation measures should be identified and analyzed through the National Environmental Policy Act process and mitigation costs should be incorporated into overall project costs.

In recent years the Corps has made substantial changes to policies and programs to better implement ecosystem management approaches. For example, the Corps has taken significant steps through the substantial revision of its Water Resources and Policies (EP 1165-2-1). Revisions to Chapter 19, establishing procedures for ecosystem protection and restoration in navigation projects, are particularly relevant. Chapter 19 outlines opportunities for innovative resolutions of conflicts generated by projects such as Sand Point. Our agencies can and should do a better job of providing ecosystem protection throughout Alaska, primarily by development of mutually agreeable, compensatory mitigation measures.

As discussed in my recent June 2, 1998, letter agreeing to a meeting between us, I believe improved communication between our agencies could do much to alleviate serious disagreement on mitigation measures. Because mutually acceptable mitigation alternatives and their costs have not been planned to date, the Service views economic analyses conducted in the Environmental Assessment and Interim Feasibility Report as incomplete. We would like your agency to re-examine potential mitigation proposals for inclusion in the Sand Point project upon availability of funding appropriations. In addition to pursuing mitigation alternatives for the Sand Point Project, I would like to discuss ongoing policy issues concerning the anticipated location of a material site, use of quarry of materials, and the impact of quarry activities related to this project.

It is our intent to work with the Corps and the Aleutians East Borough to further pursue off-site mitigation opportunities to replace near-shore habitat, including potential opportunities to use experimental restoration techniques. Until a meeting can be scheduled, I invite your staff to contact Ann Rappoport, Field Supervisor, Ecological Services Anchorage Field Office, at (907) 271-2787.

Sincerely,

Richard A. Pospahala

David B. Allen
Regional Director

Fish and Wilflife Service Reasons for Not Agreeing to Proposed Stream Clearing As Mitigation for the Sand Point Project :

The proposed plan to clear openings to John Nelson and Red Cove lakes over a 25-year period does not provide adequate compensation for the permanent loss of near-shore aquatic habitat because:

1) the scope of the proposed mitigation is not commensurate with the loss of 18 acres of prime marine aquatic habitat [by comparison two streams were only marginally acceptable for the 5- acre loss];

2) the proposed 25-year project duration is less than the life of the proposed boat harbor;

3) reports of the Aleutians East Borough note these streams are already opened periodically by natural phenomenon;

4) Borough reports note the streams are already periodically maintained by local volunteers;

5) Alaska Department of Fish and Game and the Aleutians East Borough reports note that when blockages occur, they typically do not hinder either the downstream dispersal of smolt or upstream return of spawning adult salmon;

6) the log material in these streams is part of a natural cycle contributing valuable woody debris and nutrients to the stream systems;

7) the proposed mitigation is unlikely to result in dependable resource gains: ADF&G field reports note the periodic natural saltwater intrusion will reduce or eliminate any "gains" in salmon production due to clearing; and

8) there have been no follow-up studies to determine if existing stream clearing activities at John Nelson and Red Cove lakes have been effective at increasing salmon production.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. Tudor Rd.
Anchorage, Alaska 99503-6199

IN REPLY REFER TO:

AES/ESO/WAES

JUN 2 1998

ATTACHMENT 2

Colonel Sheldon L. Jahn
District Engineer, Alaska District
Corps of Engineers
P.O. Box 898
Anchorage, Alaska 99506-0898

Dear Colonel Jahn:

Thank you for your invitation to me and my staff to meet and discuss ways to promote a closer interagency working relationship and increase the effectiveness of the Alaska District's Regulatory Program. Although some time has passed since your request, in the interim we and your staff have informally discussed tentative meeting dates, agenda items, and the appropriate participants.

We agree that there are several programmatic regulatory issues that would benefit from an in-depth discussion and welcome the opportunity to resolve them. Examples include, but are not limited to General Permits; inclusion of Fish and Wildlife Service report findings in the decision-making process; Aquatic Resources of National Importance determinations; Pre-discharge notice reviews, and the timing of public notice dissemination with limited review periods.

Although I am aware that there are frequent differences of opinion between our respective agencies, let me assure you that we are fully aware of our respective roles and responsibilities in the administration of the Clean Water Act Section 404 regulatory program. We are also aware that our Fish and Wildlife Coordination Act reports constitute the Department of the Interior's findings relative to the fish and wildlife resources in a project area, the potential impacts of the proposed project on those resources, and the means and measures necessary to mitigate such impacts.

The Service has the responsibility to comment on all aspects of federally funded or permitted actions as to their affects on fish and wildlife resources. The Service's mission is to conserve fish and wildlife resources. In order to ensure such resources are conserved, departmental findings are prepared to enhance the Corps' decision-making process. We welcome suggestions by the Corps to improve the value of our reports and enable our staff to work interactively on large or controversial proposals.

My staff will continue working with Mr. Jeff Towner to complete planning for our meeting. I have asked Susan Brewer of our Regional Office (907-786-3398) to contact Mr. Towner and work out the details. I look forward to our meeting and hope that it will result in improved protection of fish, wildlife, and wetlands.

Sincerely,

David B. Allen

David B. Allen
Regional Director

SAND POINT, ALASKA

REPORT OF THE CHIEF ENGINEERS, DEPARTMENT OF THE ARMY

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
WASHINGTON, D.C. 20314-1000

REPLY TO
ATTENTION OF:

CECW-PE (10-1-7a)

13 OCT 1998

SUBJECT: Sand Point, Alaska

THE SECRETARY OF THE ARMY

1. I submit for transmission to Congress my report on Sand Point, Alaska. It is accompanied by the report of the district and division engineers. These reports are in partial response to a resolution by the Committee on Public Works of the House of Representatives dated 2 December 1970. The committee requested review of the reports of the Chief of Engineers on Rivers and Harbors in Alaska, published as House Document Number 414, 83rd Congress, and other pertinent reports, with a view to determine whether any modifications of the recommendations contained therein are advisable at the present time. Preconstruction engineering and design activities for this proposed project will be continued under the authority provided by the resolution cited above.

2. The reporting officers recommend construction of an enclosed 8.6-acre basin and maneuvering area and a 3-acre entrance channel area. A 650-foot extension would be added to the south breakwater of the existing harbor. A second breakwater, 730 feet long, would be constructed from shore. The crest elevation of the breakwaters would be +16 feet at mean lower low water (MLLW). The entrance channel and maneuvering area would be dredged to a depth of -18 feet MLLW, and the mooring basin would be dredged to a depth of -17 feet MLLW. The float layout would accommodate 37 large vessels ranging in length from 80 to 150 feet. The plan would provide year-round moorage for large vessels, reduce vessel operating costs, and provide a harbor of refuge.

3. Project costs are allocated to the commercial navigation purpose. The estimated first cost of the general navigation features (GNF) of the recommended plan based on October 1997 price levels is $8,370,000. The GNF costs include channel excavation and breakwater construction. In accordance with Section 101 of the Water Resources Development Act (WRDA) of 1986, as amended by Section 201 of WRDA 1996, the ultimate Federal and non-Federal shares of GNF are estimated to be $6,780,000 and $1,590,000, respectively. In addition, the Federal Government would incur the costs of navigation aids currently estimated to be $8,000. The non-Federal portion includes 10 percent of the cost for the general navigation facilities which are based on an overall project depth less than -20 feet MLLW and an additional cash payment of 10 percent of costs allocated to GNF, including interest, less credit for land, easements, rights-of-way, and relocations over a period not to exceed 30 years. Creditable non-Federal lands,

easements, rights-of-way, and relocations are estimated to be $65,000. In addition to this amount, the local sponsor, the Aleutians East Borough, will be investing $3,085,000 in local service facilities which include a float system, dredging of the moorage basin, and real estate for the non-Federal moorage basin. Total costs for all features required to obtain the projected navigation benefits, including GNF, lands, easements, rights-of-way, and relocations, local service facilities, and aids-to-navigation are estimated to be $11,463,000. Project benefits are from commercial fishing travel cost savings and reduction in vessel damages associated with reduction in vessel rafting. Average annual benefits and costs, based on October 1997 price levels and a discount rate of 7 1/8 percent, are estimated at $1,739,000 and $905,000, respectively, with a resulting benefit-cost ratio of 1.9 to 1. Net benefits are estimated at $834,000 annually. The annual Federal operation, maintenance, repair, replacement, and rehabilitation cost of $6,000 includes breakwater armor replacement, hydrographic surveys, maintenance of navigation aids, and increased Federal maintenance dredging. The non-Federal operation, maintenance, repair, replacement, and rehabilitation of $22,000 include float maintenance and repair and dredging of berthing area.

4. Washington level review indicates that the proposed plan is technically sound, economically justified, and environmentally and socially acceptable. The proposed project complies with applicable U.S. Army Corps of Engineers planning procedures and regulations. Also, the views of interested parties, including Federal, State, and local agencies have been considered. I concur with the findings and conclusions of the reporting officers. Accordingly, I recommend that deep draft navigation improvements for Sand Point, Alaska, be authorized generally in accordance with the recommended plan, with such modifications as in the discretion of the Chief of Engineers may later be advisable. My recommendation is subject to cost-sharing, financing, and other applicable requirements of WRDA 1986 and WRDA 1996 for this kind of project. Also, this recommendation is subject to the non-Federal sponsor agreeing to comply with applicable Federal laws and policies, including the following requirements:

a. Provide, operate, maintain, repair, replace, and rehabilitate, at its own expense, the local service facilities in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government. The mooring basin and the mooring facilities have been identified as local service facilities;

b. Provide all lands, easements, and rights-of-way, and perform or ensure the performance of all relocations determined by the Federal Government to be necessary for the construction, operation, maintenance, repair, replacement, and rehabilitation of the general navigation features (including all lands, easements, rights-of-way, and relocations necessary for dredged material disposal facilities and the local service facilities);

c. Accomplish all removals determined necessary by the Federal Government other than those removals specifically assigned to the Federal Government;

d. Provide, during the period of construction, a cash contribution equal to the following percentage of the total cost of construction of the general navigation features which include the construction of land-based and aquatic dredged material disposal facilities that are necessary for the disposal of dredged material required for project construction, operation, or maintenance and for which a contract for the facility's construction or improvement was not awarded on or before 12 October 1996: 10 percent of the costs attributable to dredging to a depth not in excess of 20 feet;

e. Repay with interest, over a period not to exceed 30 years following completion of the period of construction of the project, up to an additional 10 percent of the total cost of construction of general navigation features depending upon the amount of credit given for the value of lands, easements, rights-of-way, and relocations provided by the non-Federal sponsor for the general navigation features. If the amount of credit exceeds 10 percent of the total cost of construction of the general navigation features, the non-Federal sponsor shall not be required to make any contribution under this paragraph, nor shall it be entitled to any refund for the value of lands, easements, rights-of-way, and relocations in excess of 10 percent of the total cost of construction of the general navigation features;

f. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the general navigation features for the purpose of inspection and, if necessary, for the purpose of operating, maintaining, repairing, replacing, and rehabilitating the general navigation features;

g. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, replacement, and rehabilitation of the project, any betterments, and the local service facilities, except for damages due to the fault or negligence of the United States or its contractors;

h. Keep, and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, and other evidence is required, to the extent and in such detail as will properly reflect total cost of construction of the general navigation features, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and local governments at 32 CFR, Section 33.20;

i. Perform, or cause to be performed, any investigations for hazardous substances as are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601-9675, that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the construction, operation, maintenance, repair, replacement, or rehabilitation of the general navigation features. However, for lands that the Government determines to be subject to the navigation servitude, only the Government shall perform such investigation unless the Federal Government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction;

j. Assume complete financial responsibility, as between the Federal Government and the non-Federal sponsor, for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the construction, operation, maintenance, repair, replacement, and rehabilitation of the general navigation features;

k. To the maximum extent practicable, perform its obligations in a manner that will not cause liability to arise under CERCLA;

l. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987, and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way required for construction, operation, maintenance, repair, replacement, and rehabilitation of the general navigation features, and inform all affected persons of applicable benefits, policies, and procedures in connection with said act;

m. Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army";

n. Provide a cash contribution equal to the non-Federal cost sharing percentage of the project's total historic preservation mitigation and data recovery costs attributable to commercial navigation that are in excess of 1 percent of the total amount authorized to be appropriated for commercial navigation;

o. For so long as the Project remains authorized, operate and maintain the local service facilities and any dredged or excavated material disposal areas, in a manner compatible with the Project's authorized purposed and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government;

p. Enter into an agreement which provides, prior to construction, 25 percent of preconstruction engineering and design (PED) costs;

q. Provide, during construction, any additional funds needed to cover the non-Federal share of PED costs; and

r. Do not use Federal funds to meet the non-Federal sponsor's share of total project costs unless the Federal granting agency verifies in writing that the expenditure of such funds is expressly authorized.

5. The recommendation contained herein reflects the information available at this time and current departmental policies governing formulation of individual projects. It does not reflect program and budgeting priorities inherent in the formulation of a national civil works construction program nor the perspective of higher review levels within the executive branch. Consequently, the recommendation may be modified before it is transmitted to Congress as a proposal for authorization and implementation funding. However, prior to transmittal to the Congress, the non-Federal sponsor (the Aleutians East Borough), the State of Alaska, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

JOE N. BALLARD
Lieutenant General, U.S. Army
Chief of Engineers

FAX TRANSMITTAL

STATE OF ALASKA
OFFICE OF THE GOVERNOR

TONY KNOWLES
GOVERNOR

FRAN ULMER
LIEUTENANT GOVERNOR

DIVISION OF GOVERNMENTAL
COORDINATION
PO BOX 110030
JUNEAU, AK 99811-0030

Telephone: (907) 465-3562
Fax: (907) 465-3075

Date: July 13, 1998
Pages: 1 + Cover

From: Sylvia Watson
Phone: (907) 465-3562
E-mail: Sylvia_Watson@gov.state.ak.us

Regarding: Paperwork you requested on Sand Point

To: Mr McIntyre   Fax No.: 703-428-6529

Comments: Please find attached the paperwork you requested on the Sand Point project. If you have any further questions on the project Jennifer Wing or Jeff Davis of our Anchorage office will be able to help you their phone # is 907-274-7470.

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 898
ANCHORAGE, ALASKA 99506-0898

HARBOR IMPROVEMENTS
FINAL INTERIM FEASIBILITY REPORT
AND ENVIRONMENTAL ASSESSMENT

SAND POINT, ALASKA

April 1998

SUMMARY

This report examines the need for additional protected harbor space at Sand Point, Alaska, and determines the feasibility of Federal participation in potential improvements. The community of Sand Point lies on the Pacific coast of the southwestern Alaska Peninsula, in one of the State's most productive fishing areas. The harbor currently provides protected moorage for 144 vessels less than 80 feet in length. No permanent moorage is available for vessels larger than 80 feet. In recent years, the transient fleet operating in the Bering Sea/Aleutian Island area, made up primarily of vessels ranging from 80 to 150 feet, has grown significantly. Permanent and temporary space for this fleet is essential.

Two harbor design alternatives south of the existing harbor were considered at Sand Point. The recommended plan has an 8.6-acre basin and maneuvering area and a 3-acre entrance channel area. It would provide permanent, protected moorage for 37 large commercial fishing vessels ranging in length from 80 to 150 feet.

The features of the project that contribute to the National Economic Development (NED) have a construction cost of $11,455,000 (October 1997 price level) excluding navigation aids, an annual NED investment cost of $877,000, and annual benefits of $1,739,000. The project's benefit-to-cost-ratio is 1.9, with annual net benefits of $834,000. The fully funded cost is estimated as $12,462,000.

As local sponsor, the Aleutians East Borough would be required to pay the non-federal share of the costs of construction of general navigation features as specified by Section 101 of the Water Resources Development Act of 1986 (Public Law 99-662). This amount is currently estimated at $1,795,000. The borough must also pay the entire cost of some local NED features (including the basin and float system) and other local features discussed in this report. The current estimate of the total non-federal share of all costs of the project is $4,274,000.

The Federal share of project costs is currently estimated at $7,181,000, excluding $8,000 for navigational aids. It is recommended that this harbor be constructed with Federal participation.

Revised Sep 98

PERTINENT DATA

Harbor Improvements
Sand Point, Alaska
Recommended Plan (Alternative 1)

Basin

Area	8.6 acres
Basin depth	-17 ft MLLW
Entrance channel depth	-18 ft MLLW
Dredging volume	
Entrance channel	44,300 yd^3
Maneuvering basin	3,500 yd^3
Mooring basin	31,000 yd^3
Total	78,800 yd^3

Breakwater

Design wave	6.6 ft
Length	1,300 ft
Crest elevation	+16 ft MLLW
Crest width	7.5 ft
Rock volume	
Primary armor	29,100 yd^3
Secondary rock	21,300 yd^3
Core	74,100 yd^3
Entrance channel slope armor	2,800 yd^3

PROJECT CONSTRUCTION COSTS[a]

Item	Federal	Non-federal	Total
General Navigation Features[b]	$6,640,000	$1,660,000	$8,300,000
Local NED-associated costs[c]	---	3,155,000	3,155,000
Subtotal NED costs	$6,640,000	$4,815,000	$11,455,000
Nav. aids - U.S. Coast Guard	$8,000		8,000
TOTAL			$11,463,000

NED investment cost (includes interest during construction)	$11,910,000
Interest and amortization of NED investment cost	$877,000
Ave. annual NED maintenance cost	28,000
Total average annual cost	$905,000
Average annual NED benefits	$1,739,000
Net annual NED benefits	$834,000
Benefit/cost ratio (7-1/8% interest)	1.9

[a] Basic assumptions:
(1) October 1997 price levels.
(2) 50-year project life.

[b] Cost sharing reflects provisions of the Water Resources Development Act of 1986.
[c] NED = National Economic Development.

Revised Sep 98

HARBOR IMPROVEMENTS
FINAL INTERIM FEASIBILITY REPORT
AND ENVIRONMENTAL ASSESSMENT

SAND POINT, ALASKA

Contents

Figures

Tables

Environmental Documents

Appendixes

A – Hydraulic Design

B – Economic Analysis

C – Geotechnical Report

D – Chemical Data Report

E – Cost Estimate

F – Real Estate Requirements

G – Correspondence

H – Sponsor's Financing Plan and Corps' Assessment

SPMAIN.DOC
April 20, 1998

GLOSSARY

Abbreviations, Acronyms, and Technical Terms

ADF&G = Alaska Department of Fish and Game
ADOT/PF = Alaska Department of Transportation and Public Facilities
BCR = benefit/cost ratio
CDQ = community development quota
CERC = Coastal Engineering Research Center; part of WES
Continuing Authority = A program that permits the Corps to study, construct, and maintain projects for certain purposes without specific congressional authorization. Federal cost limits apply.
DPR = Detailed Project Report
ER = Engineering Regulation
GI = General Investigations. This is the type of Corps study specifically authorized by Congress. (See Continuing Authority.)
ft = foot, feet
ft^2 = square foot, feet
ft^3 = cubic foot, feet
gal = gallon(s)
General Navigation Features = Features of a project which can be paid for in part by the Federal Government through the Corps of Engineers. A breakwater is a general navigation feature.
H = horizontal
h = hour(s)
kg = kilogram(s)
lb = pound(s)
LERRD = lands, easements, rights-of-way, relocation, and disposal areas
LOA = Length Overall (said of a vessel)
mg = milligram(s)
MLLW = mean lower low water
mi/h = miles per hour
mo = month(s)
NED = National Economic Development. NED features of a project are those that increase the net value of goods and services provided to the economy of the United States as a whole.
NEPA = National Environmental Policy Act
NMFS = National Marine Fisheries Service
NOAA = National Oceanic and Atmospheric Administration
NOS = National Ocean Service
NPFMC = North Pacific Fishery Management Council
NRC = Natural Resources Consultants, Inc.
O&M = operation and maintenance
OM&R = operation, maintenance, and replacement
PL = Public Law
s = second(s) (time)
SPM = *Shore Protection Manual*
USACE = U.S. Army Corps of Engineers
USCG = U.S. Coast Guard
USFWS = U.S. Fish and Wildlife Service
V = vertical
WES = Waterways Experiment Station (of the U.S. Army Corps of Engineers)
yd^3 = cubic yard(s)
yr = year(s)
μg = microgram(s)

CONVERSION TABLE FOR SI (METRIC) UNITS

Units of measurement used in this report can be converted to SI (metric) units as follows:

Multiply	By	To obtain
cubic yards	0.7646	cubic meters
cubic yards per year	0.7646	cubic meters per year
Fahrenheit degrees	*	Celsius degrees
feet	0.3048	meters
feet per second	0.3048	meters per second
inches	2.54	centimeters
knots (international)	0.5144444	meters per second
miles (U.S. statute)	1.6093	kilometers
miles (nautical)	1.8520	kilometers
miles per hour	1.6093	kilometers per hour
pounds (mass)	0.4536	kilograms
yards	0.9144	meters

* To obtain Celsius (C) temperature readings from Fahrenheit (F) readings, use the following formula: $C = (5/9)(F - 32)$.

ACKNOWLEDGMENTS

This report was prepared by the staff of the Alaska District, U.S. Army Corps of Engineers, in Anchorage, Alaska. The study manager was Ms. Janis Kara of the Economics Section in the Civil Works Branch, Engineering Division.

Personnel of the Hydraulics and Hydrology Section of the Civil Works Branch, including Mr. David Martinson, Mr. Ken Eisses, and Mr. Alan Jeffries, did the hydraulic analysis. Mr. Mel Zimmermann estimated the project cost. Mr. Guy Hopson and Mr. Doug Trosper of Real Estate Division analyzed the real estate requirements. Mr. Charles Wilson and Mr. Bret Walters of the Geotechnical Section prepared the geotechnical appendix.

Mr. Andrew Miller and Ms. Janis Kara of the Economics Section, Civil Works Branch, performed economic analyses. Environmental analyses were done by Mr. William Abadie and Mr. Guy McConnell of the Environmental Resources Section, Civil Works Branch.

The report was edited by Mrs. Carolyn Rinehart and Mrs. Diane Walters of Civil Works Branch. Mr. Bart Lane and Mr. Jim Fuhrer of Civil Works Branch prepared the figures.

These investigations were conducted under the direction of Mr. Claude V. Vining, Chief, Engineering Division; Mr. Kenneth E. Hitch, Chief, Civil Works Branch; Mr. Carl D. Stormer, Chief, Project Formulation Section; Mr. Ken Eisses, Chief, Hydraulics and Hydrology Section; Mr. Andrew W. Miller, Chief, Economics Section; and Mr. Guy R. McConnell, Chief, Environmental Resources Section.

Commander and District Engineer of the Alaska District during this study was Colonel Sheldon L. Jahn, Corps of Engineers.

Harbor Improvements
Final Interim Feasibility Report
Sand Point, Alaska

1. INTRODUCTION

1.1 Study Authority

This study is in partial response to the Rivers and Harbors in Alaska study resolution, adopted by the U.S. House of Representatives Committee on Public Works on December 2, 1970. The resolution states in part:

> *Resolved by the Committee on Public Works of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors is hereby requested to review the reports of the Chief of Engineers on Rivers and Harbors in Alaska, published as House Document Numbered 414, 83d Congress, 2d Session; . . . and other pertinent reports, with a view to determine whether any modifications of the recommendations contained therein are advisable at the present time.*

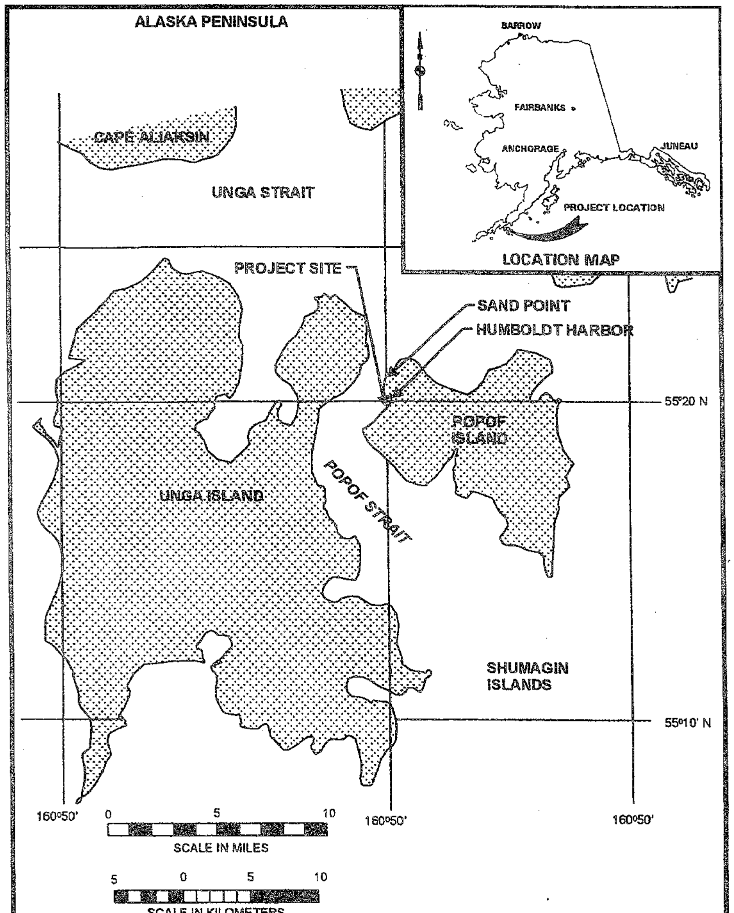
The study was requested by the Aleutians East Borough to investigate navigation improvements at Sand Point, Alaska.

1.2 Scope of Study

This study investigates the feasibility of navigation improvements at Sand Point, Alaska (figure 1), a fishing and fish processing community in the Aleutian Island chain. The investigation was limited to means of satisfying immediate and future needs for large craft refuge within the study area. The study was conducted and the report prepared in accordance with Principles and Guidelines for Water Resources and other authorities which establish and define the goals and procedures for water resources planning as contained in Engineer Regulation 1105-02. Alternatives are examined for their feasibility in consideration of engineering, economic, environmental and other criteria. A determination of the extent of Federal interest in accordance with present laws and policies is also included.

1.3 Study Participation

The Alaska District, U.S. Army Corps of Engineers, has primary responsibility for this study. The report was prepared with assistance from many individuals and



ALASKA DISTRICT CORPS OF ENGINEERS CIVIL WORKS BRANCH	LOCATION AND VICINITY MAP SAND POINT HARBOR IMPROVEMENTS	1

agencies, especially the following: The Aleutians East Borough, the city of Sand Point, the Alaska Department of Transportation and Public Facilities (ADOT&PF), the U.S. Fish and Wildlife Service (USFWS), and the Alaska Department of Fish & Game (ADF&G).

1.4 Related Reports and Studies

The following studies have examined navigation improvements at Sand Point.

- A Corps of Engineers review report in October 1969 indicated the need for a federally constructed small harbor at Sand Point, Alaska.

- A study report dated June 1970 from the Chief of Engineers, Department of the Army, recommended the construction of two rubblemound breakwaters totaling 1,765 feet; a 1,175-foot diversion dike; and a diversion channel 300 feet long to protect a 16.6-acre mooring basin.

- The General Design Memorandum No. 1 (Phase I and Phase II), prepared in October 1973, proposed the construction of the present harbor facility.

- A draft and a final Environmental Impact Report (EIR) were prepared in May 1974 and October 1974, respectively. The reports concluded the harbor project would result in reduced boat damages and have insignificant and mitigable adverse impacts.

- A reconnaissance report of Sand Point Harbor prepared in August 1981 identified the potential navigation problems and addressed the need to improve the harbor.

- An engineering analysis providing hydraulic design criteria for the Sand Point small boat harbor was prepared in September 1983.

- A reconnaissance report of Sand Point Harbor prepared in April 1986 presented various harbor improvement alternatives to increase the mooring capacity.

- The Corps' Alaska District contracted with Noble Consultants to screen harbor development plans at Sand Point and to prepare a report titled "Final Report Coastal Engineering, Analysis for Sand Point Harbor Design Studies, Sand Point, Alaska," The report was dated October 7, 1994.

- The Aleutians East Borough (which encompasses Sand Point) contracted with Northern Economics, in association with Ogden Beeman & Associates, Inc., and ResourcEcon, to evaluate the potential annual benefits associated with developing or expanding harbors at Akutan, King Cove, and Sand Point. The firms prepared a March 1995 report that describes the results of their study.

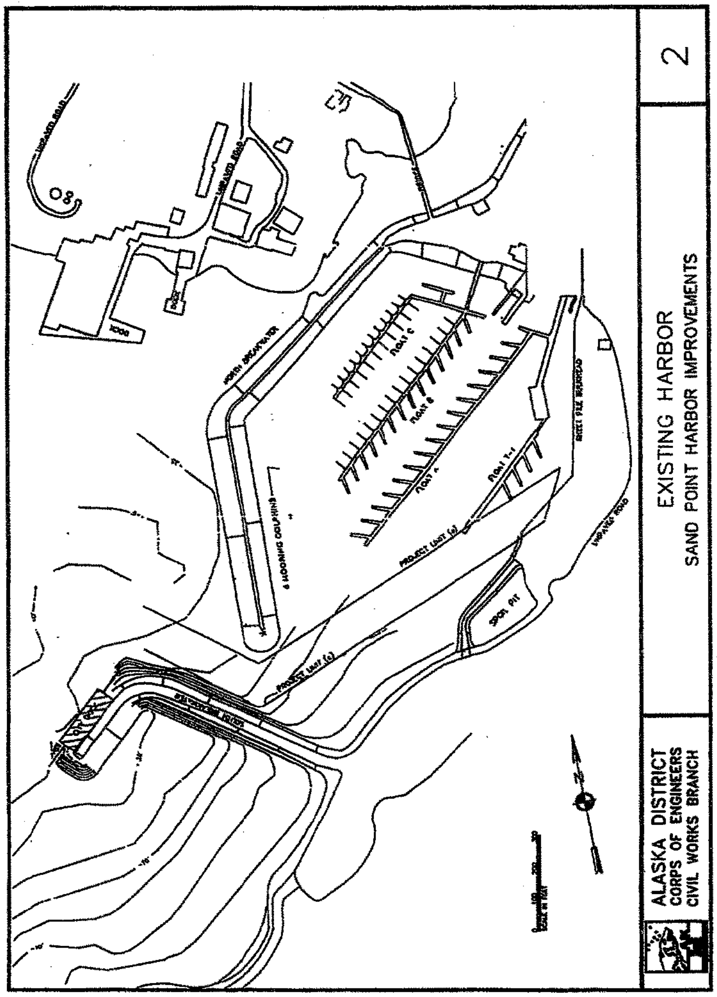
- A Detailed Project Report and Environmental Assessment were completed for Sand Point in November 1996 by the Alaska District, Corps of Engineers, under authority of Section 107 of the River and Harbor Act of 1960, as amended.

1.5 Existing Project

The Corps of Engineers constructed Humboldt Harbor at Sand Point in 1976. The harbor consists of a north breakwater 1,500 feet long, a south breakwater 1,000 feet long, and an entrance channel 18 feet deep at mean lower low water (MLLW). The breakwaters create an 16-acre mooring basin. Figure 2 shows the general layout of Humboldt Harbor.

The mooring area consists of 144 slips for vessels up to 65 feet, 1,400 feet of floating dock to which transient boats can side-tie, and 750 feet of steel bulkhead that can be used to side-tie transient vessels. Five steel-and-timber-pile dolphins near the north breakwater are used by larger floating processors and commercial barges. The harbor has a servicing dock with a 42-by-105-foot working area for loading and offloading containers and cargo.

The city widened and extended the south breakwater and constructed a 62-by-200-foot dock on the seaward side of the breakwater in a water depth of -30 feet MLLW.


EXISTING HARBOR
SAND POINT HARBOR IMPROVEMENTS
ALASKA DISTRICT
CORPS OF ENGINEERS
CIVIL WORKS BRANCH
2

2. PROBLEM IDENTIFICATION

2.1 Project Area Description

The city of Sand Point is on the northwest portion of Popof Island, in the Shumagin Island group that lies south of the Alaska Peninsula. Sand Point was originally founded as a cod fishing station in 1887, and today it continues to support the regional fishing industry. The city's harbor is home to a locally based fishing fleet and is heavily used by transient vessels during and between fishing seasons.

The city government of Sand Point supports a host of municipal services, including a health clinic staffed with a family nurse practitioner, police, fire and emergency medical services, water and sewer services, road construction and maintenance, parks and recreation, and planning and zoning. The city is also responsible for the operation and maintenance of the boat harbor and associated facilities.

Sand Point has exhibited significant growth over the last three decades. Historically, the city's population has increased dramatically during periods of rapid growth in commercial fisheries. For the last few years, the population has been stable at around 1,000.

The majority of permanent residents are of Aleut and Scandinavian descent. The population is relatively young, with the proportion of people in the 5-18 age group higher than usual for a remote Alaskan fishing community. Outmigration is low and length of residency high, with 51 percent of the population having lived in Sand Point for 16 years or more.

2.1.1 Climate.

The regional climate is maritime, strongly influenced by low-pressure systems that develop in the western Aleutians and move eastward through the region. Weather generated by the low-pressure systems typically is cloudy, wet, and windy. Strong winds develop occasionally along the lee slope of the surrounding mountain peaks. Winds are most frequent and strongest along the southern peninsula slopes across Unga Strait and the western slopes of Unga Island.

The dominant factor at Sand Point is the high frequency of cyclonic storms crossing the North Pacific. Southwest and northwest winds exceeding 70 miles per hour have been recorded. The average windspeed year-round is about 13 miles per hour.

Due to the moderating effect of the ocean, average daily high and daily low temperatures at the study site seldom vary more than 11 degrees in any month. Below-freezing readings are uncommon. Temperatures at Sand Point are discussed further and tabulated in appendix A, section 2.1.

Cloudiness is prevalent, and measurable precipitation occurs 60 percent of the time annually. The maximum total monthly rainfall is 23 inches, and the maximum recorded rainfall within a 24-hour period is 9 inches. Annual average snowfall is about 40 inches, and the maximum recorded daily snowfall is 9 inches. The precipitation at Sand Point is discussed further and tabulated in appendix A, section 2.1.

2.1.2 Waves and Tides.

Sand Point's harbor is sheltered from Pacific Ocean deep-water swells by the islands in the Shumagin group. Only the local wind-generated waves can approach the harbor from the west-southwest to the north-northwest. Due to the limited wind fetch, the generated wave periods expected offshore of the harbor range from 3 to 4 seconds.

Tides in the Sand Point area are mixed semidiurnal. Typically, a lunar day consists of two high and two low tides, each of different magnitude. The lower-low normally follows the higher-high by about 7 to 8 hours, whereas the next higher-high (after the lower-high and the higher-low waters) follows in about 17 hours.

The National Ocean Service (NOS) has been collecting tide measurements at Sand Point since 1972. Tidal characteristics based on this data are listed in table 2-1.

TABLE 2-1.—*Recorded tidal data for Sand Point, Alaska (ft)*

Extreme High Water	+11.4
Mean Higher High Water (MHHW)	+7.3
Mean High Water (MHW)	+6.6
Mean Tide	+4.0
Mean Low Water (MLW)	+1.4
Mean Lower Low Water (MLLW)	0.0 (datum)
Extreme Lower Low Water	-3.6

Source: National Ocean Service.

2.1.3 Biological Resources.

Local vegetation is typical of the maritime tundra of the region. Grasses, sedges, shrub willows, wild berry plants, and wild flowering plants are the predominant vegetation forms. Northern sea lions, sea otters, seals, and small whales are seen in the area. Bald eagles, ptarmigan, gulls, petrels, kittiwakes, and a variety of sea birds are present.

The offshore waters of Sand Point support a variety of marine fish resources. Humboldt Creek, which empties into Humboldt Harbor, supports runs of salmon (coho and pink) and Dolly Varden. The near-shore waters adjacent to Black Point support substantial concentrations of juvenile pink salmon between mid-May and mid-June. Pink salmon spawning is known to occur in several streams on the north side of Popof Island.

Popof Island supports a variety of sea birds, sea ducks, waterfowl, passerines, and raptors. Bald eagles roost at Black Point and occasionally at the city dock, and feed on seafood wastes produced by a nearby cannery. Sea ducks and other birds use the area for feeding and resting; species observed in the area include harlequin ducks, oldsquaws, pigeon guillemots, and black-legged kittiwakes. Steller's eiders, white-winged scoters, buffleheads, and mergansers have been seen frequenting the area.

Terrestrial fauna on the island is limited. The most abundant mammal on Popof Island is the ground squirrel. Other species include bison, small rodents, and hares. Marine mammals inhabiting the waters include harbor seals, sea otters, porpoises, and several whale species.

2.1.4 Employment.

Approximately 87 percent of the Sand Point work force are engaged in either commercial fishing or the seafood processing industry. Local employment rises during the summer, primarily due to the salmon industry. The median household income for Sand Point is $42,083. The region's employment situation is discussed more fully in appendix B.

2.1.5 Economic Base.

Sand Point's economy relies on commercial fishing, related support facilities, and seafood processing. The largest employer in Sand Point is the fishing industry, occupying more than 80 percent of the work force full-time. This is followed by government (city and borough) and local private businesses. The region's economy is discussed more fully in appendix B.

2.1.6 Government.

The city of Sand Point is a first-class city under Title 29 of the Alaska State Statutes. The city council consists of the mayor and six elected members. The city council and mayor serve a three-year term; the City holds annual elections the first Tuesday of October. The mayor acts as the personnel officer and is in charge of all day-to-day operations, including job and duty assignments.

2.1.7 Police Protection.

The Sand Point police department includes a chief and three officers. All police are certified by the State of Alaska. The city also has a volunteer officer whose primary duties are Emergency Medical Service and Fire Department activities as well as teaching an anti-drug program to schools within the Aleutians East Borough. The city has a 24-hour emergency telephone dispatching service (911).

2.1.8 Fire Protection.

Sand Point has one fire truck and a volunteer department. The city has fire hydrants with a water system throughout the community. There are three reservoirs; one holds 500,000 gallons and the two others hold 100,000 gallons each. Sand Point has a class 7 insurance rating.

2.2 Problem Description

Since the Corps constructed Humboldt Harbor in 1976, the makeup of the fleet using the harbor has changed significantly. The size as well as the number of vessels fishing the waters of the Aleutian Island chain has grown dramatically. Figure 3 shows large commercial fishing vessels in the harbor.

In waters once dominated by the typical salmon seiners less than 58 feet in length, the much larger tenders and crabbers ranging in length from 80 to 150 feet have become

FIGURE 3a.—Large commercial fishing vessels crowd into Sand Point harbor.

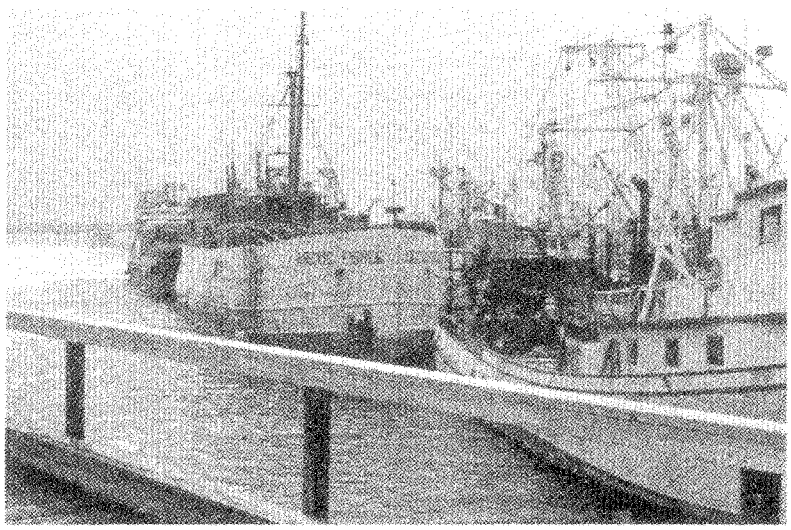


FIGURE 3b.—Closeup of fishing vessels moored at Sand Point.

increasingly common. There is currently a great demand for moorage by vessels larger than 80 feet.

Many skippers fishing in the Sand Point area currently take their vessels long distances to secure protected moorage space on the frequent occasions when Humboldt Harbor is full. Alternate Alaskan ports with protected moorage include King Cove, Unalaska/Dutch Harbor, and Kodiak. This study was undertaken to determine the feasibility of Federal participation in enlarging Sand Point's harbor capacity to alleviate crowding and reduce travel-associated costs incurred by transient craft. This analysis focuses on vessels greater than 80 feet in length, since sufficient moorage capacity exists for smaller vessels within the existing harbor.

3. PLAN FORMULATION

3.1 Planning Criteria

3.1.1 National Economic Development Objective.

The Federal objective of water and land resources planning is to contribute to the National Economic Development (NED) in a way that is consistent with protecting the Nation's environment. NED features increase the net value of goods and services provided to the economy of the United States as a whole. Only benefits contributing to the NED may be claimed for economic justification of the project. For the Sand Point harbor, NED features include the breakwater, channels, basins, and float systems.

Resource planning must be consistent with the NED objective and must consider economic, social, and environmental as well as engineering factors. The following criteria for developing alternative plans are used to evaluate those plans.

3.1.2 Public Concerns.

The public perceptions and desires were reviewed for incorporation into study solutions. By soliciting information from the public, subsequent planning efforts were directed to respond to these perceptions and desires. Public concerns were expressed directly at public meetings, and indirectly through government representation and agencies.

3.1.3 Engineering Criteria.

The plans should be adequately sized to accommodate present and future user needs and provide for development of harbor-related facilities. They should protect against wind-generated waves and boat wakes. Adequate depths and entry are required for safe navigation. Plans considered must be suitable for construction.

3.1.4 Economic Criteria.

The general economic criteria that apply in formulating and comparing alternatives are summarized as follows:

a. Tangible project benefits must equal or exceed economic costs. The benefit-to-cost (B/C) ratio is a measure of this criterion. The B/C ratio must exceed 1-to-1 to achieve economic justification.

b. The scale of development should consider maximization of net benefits (benefits minus costs).

c. The objectives cannot be attained by a more economical solution.

Principles and guidelines for Federal water resources planning require that, during plan formulation, a plan be identified that produces the greatest contribution to the National Economic Development (NED). This plan, called the NED plan, is defined as the plan providing the greatest net benefits as determined by subtracting annual costs from annual benefits. The Corps of Engineers policy requires recommendation of the NED plan unless there is adequate justification to do otherwise.

All alternatives considered to meet project needs should be presented in quantitative terms where possible. Benefits attributed to a plan must be expressed in terms of a time value of money and must exceed equivalent economic costs for the project. To be economically feasible, each separate portion or purpose of the plan must provide benefits at least equal to the cost of that unit. The economic evaluation of alternative plans is on a common basis of October 1997 prices, a project life of 50 years, and an interest rate of 7-1/8 percent.

3.1.5 Environmental Criteria.

Environmental considerations include identifying forms of aquatic life and wildlife that might be impacted by a plan's implementation, minimizing disruption of the area's natural resources, maintaining consistency with the Alaska Coastal Management Plan, and using measures to protect or enhance existing environmental values.

An Environmental Assessment (EA) was prepared and is included with this report.

3.1.6 Social Criteria.

Plans considered must minimize adverse social impacts and must be consistent with State, regional, and local land use and development plans, both public and private. The selected plan must be acceptable to the non-federal sponsor.

3.2 Description of Alternative Plans

3.2.1 No Action.

If no Federal action were taken, large vessels in excess of 80 feet would continue to incur significant annual expenses associated with travel to alternate ports. Due to the lack of moorage facilities for large craft, many operators would continue to seek shelter in ports as far away as the Pacific Northwest, at considerable cost.

3.2.2 Nonstructural Alternatives.

Operators of large commercial fishing vessels near Sand Point currently have two alternatives:

a. Remove the vessels from the water, or

b. Seek shelter in other ports.

Dry-docking damages vessels and causes their owners to incur expense. In addition, boats are not available for winter use in the crab, bottomfish, herring and other fisheries.

Likewise, leaving the Sand Point area is not a desirable alternative. This practice is already occurring, as discussed in appendix B. The costs of traveling are high, and vessels cannot always be readily available throughout the year. The local economy suffers as a result.

3.2.3 Structural Alternatives.

Five sites were considered for harbor improvements at Sand Point. These included two sites north of the existing harbor, expanding the existing harbor itself, a site adjacent and to the south of the existing harbor, and a site farther south along the shoreline at Sand Point Spit, near the Peter Pan Seafoods dock. Other potential sites off the road system were not considered due to excessive costs and/or real estate requirements for providing access and infrastructure.

Given the relatively low wave climate and the performance of the existing harbor over the years, it was determined that physical modeling was not necessary for this study. Alternatives were evaluated using established design guidance given in the appropriate engineering manual and the *Shore Protection Manual* (USACE 1984).

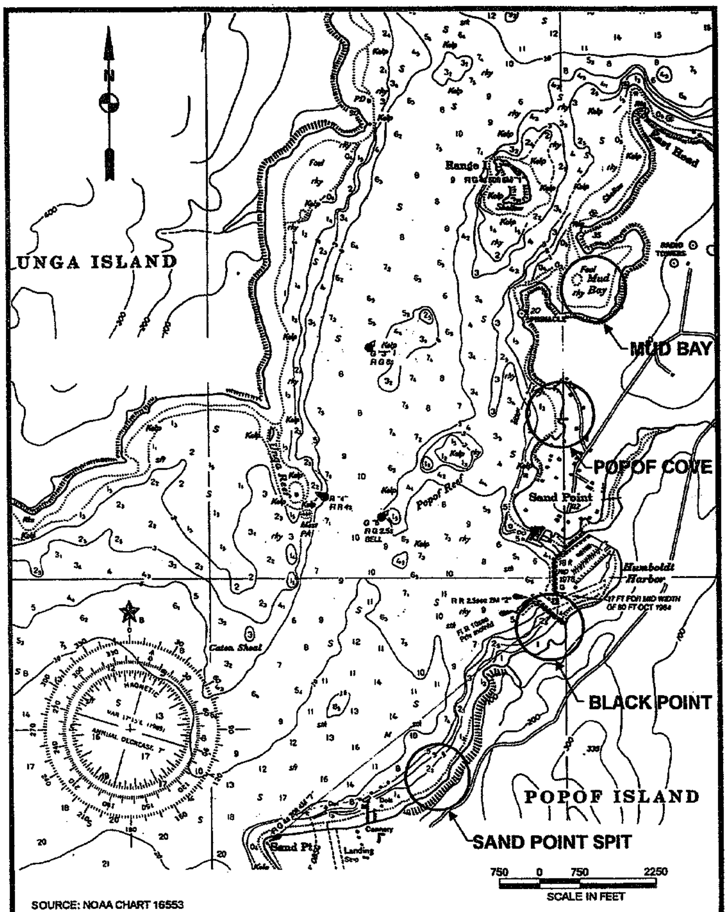
Locations of the five sites described in the following paragraphs are shown in figure 4.

Mud Bay. Mud Bay, 1.5 miles north of the existing harbor, is naturally sheltered by Range Island and two headlands. Mud Bay covers an area of 40 acres. Natural depths average less than -6 feet (ft) MLLW. The amount of dredging required to develop this site is the main reason it was eliminated from further study. Based on a 23-acre basin and entrance channel, and a design depth of -17 ft MLLW, the required dredging would be 410,000 cubic yards of material. The excessive costs of dredging and disposal of the dredged materials and the lack of infrastructure near the site resulted in the elimination of this site from further consideration.

Popof Cove. Popof Cove, 1 mile north of the existing harbor, was also investigated as a possible site for the project. Natural depths of -20 ft MLLW at this site are acceptable for the construction of a rubblemound breakwater. The average existing bottom elevation in the area for a harbor basin is less than -10 ft MLLW; substantial dredging would be required for harbor development. Another concern is that the properties surrounding the site are residential. Residents and city officials have spoken strongly against harbor development at Popof Cove. Because of the high requirements for the necessary infrastructure, and surrounding residential areas, this site was not considered further in this analysis.

Sand Point Spit. This site is 1-1/4 miles south of Humboldt Harbor, near the airport runway. The site has land available for harbor support facilities and ready access to the airstrip and road system. Investigations of existing bathymetry offshore of the spit show the –30-ft-MLLW depth approximately 300 feet offshore. The bottom elevation then drops rapidly to about -70 ft MLLW. Development of this site for the design fleet would require an extensive breakwater with excessive quantities of materials. Real estate issues involving Peter Pan Seafoods would also be a major consideration and did not appear favorable during an initial screening. This site was therefore eliminated from further study.

Humboldt Harbor. The existing harbor has been extensively studied and reconfigured to maximize vessel accommodation. At this point, nothing further can be done without adversely impacting the safety of the fleet. This is further discussed in Appendix A, Hydraulic Design (section 6.1.4).



ALASKA DISTRICT
CORPS OF ENGINEERS
CIVIL WORKS BRANCH

ALTERNATIVE SITES

SAND POINT HARBOR IMPROVEMENTS

4

Black Point. The site south of the existing harbor then became the focus of attention as an area for potential harbor expansion. Black Point is adjacent to Sand Point's existing Humboldt Harbor. This site would allow expansion of the existing harbor by modifying the south breakwater and dredging the south harbor basin. This site also offers a location for a new south harbor adjacent to the existing harbor. The two most promising structural alternatives evaluated in this study are described in the next subsection.

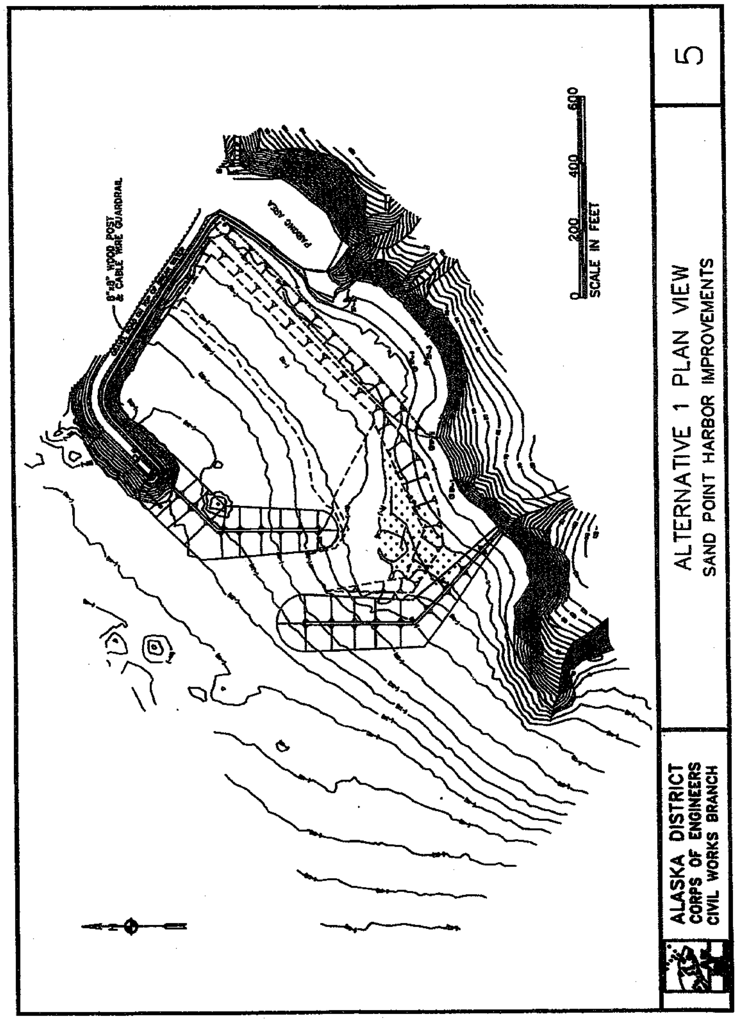
3.3 Alternatives Considered in Detail

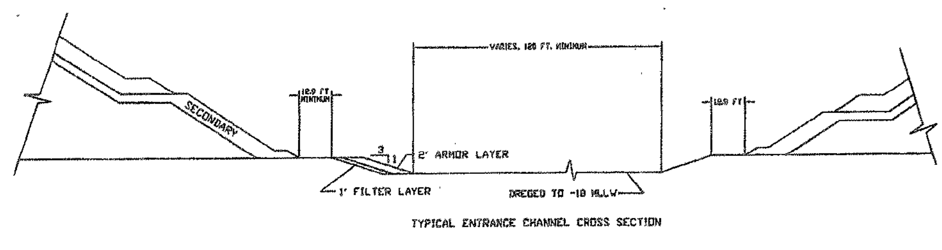
3.3.1 Alternative 1.

This alternative would construct a mooring basin adjacent and south of the existing harbor. It incorporates the southern breakwater and causeway to the city dock by extending the existing breakwater to form the mooring basin. An additional breakwater would be constructed south of the newly formed basin to provide protection from incoming waves from the south to west-southwest. The positioning of the breakwaters would create an entrance channel allowing access from the west to northwest. A plan view of alternative 1 is shown in figure 5.

This plan would accommodate the fleet of larger vessels by providing slip spaces for vessels up to 150 feet in length. A 120-foot-wide entrance channel, increasing to 230 feet in width, would approach the harbor around the head of the new extended breakwater. The harbor's accessibility would be comparable to the existing Humboldt Harbor. The additional width in the turn would allow the design vessel to enter the harbor without excessive maneuvering. The entrance channel width would be about three times the beam width of the design vessel at the entrance. In the turn, the entrance channel width becomes 1.5 times the design vessel length. This is more than adequate, since the larger vessels generally are equipped with bow thrusters and are able to maneuver unassisted. The entrance channel would have a bottom elevation of –18 ft MLLW. The entrance channel would be used as a one-way entrance. Armoring the side slope of the entrance channel would be required in depths where the wave in the channel could break. A cross section of the proposed entrance channel is shown in figure 6.

The new harbor basin would be dredged to – 17 ft MLLW. A total combined harbor basin and maneuvering area of 8.6 acres would be required.


6"x8" WOOD POST
& CABLE WIRE GUARDRAIL
PARKING AREA
0 200 400 600
SCALE IN FEET
ALTERNATIVE 1 PLAN VIEW
SAND POINT HARBOR IMPROVEMENTS
5
ALASKA DISTRICT
CORPS OF ENGINEERS
CIVIL WORKS BRANCH



TYPICAL ENTRANCE CHANNEL CROSS SECTION

N.T.S.

ALASKA DISTRICT CORPS OF ENGINEERS CIVIL WORKS BRANCH	ALTERNATIVE 1 ENTRANCE CHANNEL CROSS SECTION SAND POINT HARBOR IMPROVEMENTS	6

A 570-foot-long rubblemound breakwater would be extended from the south breakwater of the existing harbor to form the northwest side of the harbor and the eastern side of the entrance channel. A 730-foot-long breakwater would be constructed from shore, extending northwest to a depth of approximately -15 ft MLLW, where it would change to a north-south alignment to form the western side of the entrance channel. Using a design still water level of +11.5 ft MLLW, a crest elevation of +16 ft MLLW was selected. A crest width of 7.5 feet was calculated based on the armor size. A +16-ft-MLLW crest elevation also provides increased constructability of the breakwaters with relation to tidal stages.

A total of 29,100 cubic yards of armor rock, 21,300 cubic yards of secondary rock, and 74,100 cubic yards of core rock would be required for breakwater construction.

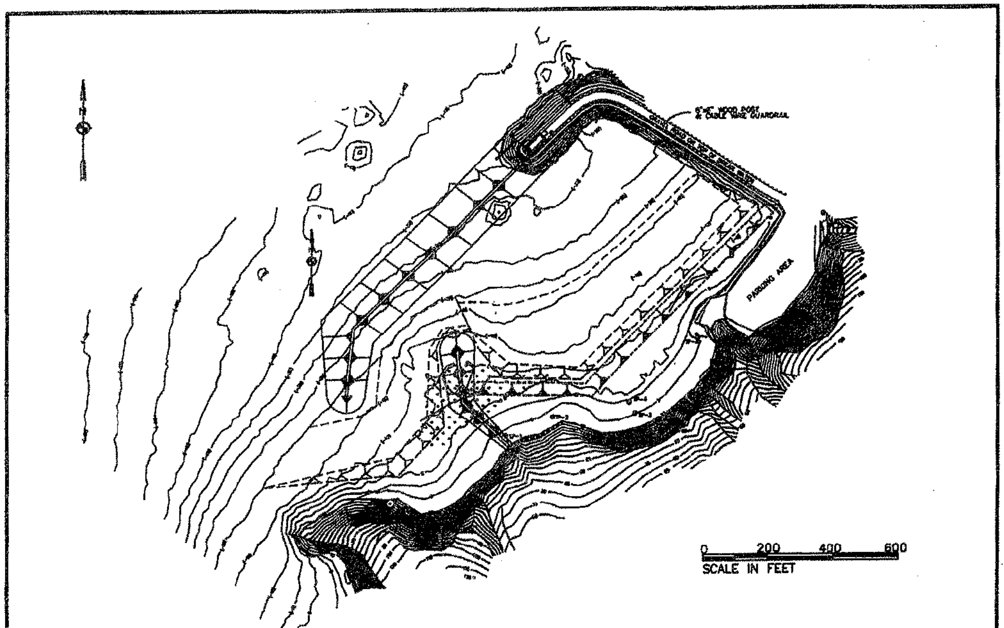
Dredged material would be disposed of in an intertidal area adjacent to the proposed harbor. The area would provide 2.7 acres of uplands by filling in subtidal area ranging from –5 ft to +13 ft MLLW. Additional dredged material could be disposed of in the new basin in depths in excess of –20 ft MLLW. Existing bottom materials are sand, gravel, and cobbles.

3.3.2 Alternative 2.

This alternative would construct a mooring basin adjacent and to the south of the existing harbor. It incorporates the southern breakwater and causeway to the city dock by extending the existing breakwater to form a basin for mooring the design fleet. An additional breakwater would be constructed south of the newly formed basin to provide protection from incoming waves from the south to west-southwest. The positioning of the breakwaters would create an entrance channel alignment allowing access from the southwest. A plan view of alternative 2 is shown in figure 7.

This alternative would accommodate the larger vessels by providing slip spaces for vessels up to 150 feet in length. A 120-foot-wide entrance channel would make a direct approach, with a slight turn into the harbor around the head of the new extended breakwater.

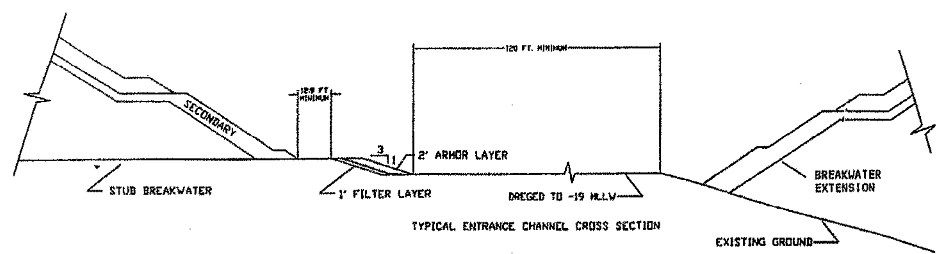
The entrance channel width would be approximately three times the beam width of the design vessel at the entrance. Armoring the side slope of the entrance channel would be required in depths where the wave in the channel could break. A cross section of the proposed entrance channel is shown in figure 8.



ALASKA DISTRICT
CORPS OF ENGINEERS
CIVIL WORKS BRANCH

ALTERNATIVE 2 PLAN VIEW
SAND POINT HARBOR IMPROVEMENTS

7



TYPICAL ENTRANCE CHANNEL CROSS SECTION

N.T.S.

ALASKA DISTRICT CORPS OF ENGINEERS CIVIL WORKS BRANCH	ALTERNATIVE 2 ENTRANCE CHANNEL CROSS SECTION SAND POINT HARBOR IMPROVEMENTS	8

The new harbor basin would be dredged to –17 ft MLLW. A total combined harbor basin and maneuvering area of 10.1 acres would be required. A 985-foot-long rubblemound breakwater would be extended from the south breakwater of the existing harbor to form the northwest side of the harbor and the eastern side of the entrance channel. Maximum depth is –35 ft MLLW along the alignment of the breakwater. A 370-foot-long breakwater would be constructed from shore and extend northwest to a depth of approximately –15 ft MLLW, where it would change to a north-south alignment to form the western side of the entrance channel. Foundation materials are sand, gravel, and cobbles, a suitable base for the rubblemound structure.

Using a design still water level of +11.5 ft MLLW, a crest elevation of +16 ft MLLW was selected. A crest width of 7.5 ft was calculated based on the armor size.

Dredging required is 70,400 cubic yards. Dredged material would be disposed of in an intertidal area adjacent to the proposed harbor. The area would provide 3.7 acres of uplands by filling in subtidal areas ranging from –5 ft to +13 ft MLLW. Additional dredged material could be disposed of in the new basin in depths in excess of -20 ft MLLW. Existing bottom materials are sand, gravel, and cobbles.

4. COMPARISON OF PLANS AND SELECTION

The two alternatives were evaluated based on environmental, economic, and design considerations. Table 4-1 is a condensed comparison of the plans.

TABLE 4-1.—*Comparison of two alternatives*

Item	Alternative 1	Alternative 2
Estimated NED construction cost (Oct 1997)	$11,455,000	$12,423,000
NED investment cost (includes IDC)	**$11,910,000**	**$12,914,000**
Annual cost		
Annual investment cost[a] (7-1/8% int., 50 yr)	$877,000	$920,000
Average annual maintenance cost	28,000	30,000
Total average annual cost	$905,000	$950,000
Annual benefits		
Average annual benefits	$1,739,000	$1,739,000
Benefit/cost ratio	1.9	1.8
Vessels accommodated	37	37
Dredged material source		
Mooring basin	31,000 yd^3	40,200 yd^3
Access and entrance channel	47,800 yd^3	30,200 yd^3
Dredged material use/disposal		
Adjacent upland spoil pit	56,200 yd^3	65,300 yd^3
Inner basin	16,300 yd^3	0
Disposal spoil pit at existing harbor	6,300 yd^3	5,100 yd^3

[a] Includes interest during construction.

4.1 Environmental Considerations

The Environmental Assessment is located in the Environmental Documents section of this report. The assessment concluded that the Sand Point harbor expansion could be built and operated with no significant effect on the quality of the human environment. The majority of impacts would be minor and of short duration. The proposed action is consistent with State and local coastal zone management programs to the maximum extent practical.

Construction would not affect any sites eligible for inclusion in the National Register of Historic Places. The project also would not affect any threatened or endangered

Revised Sep 98

species or their critical habitat. Adverse impacts have been mitigated to the extent practicable and justified. Mitigation measures include:

- Designing the harbor to maximize the number of vessels it can safely accommodate while minimizing the project footprint.
- Use of a silt curtain for in-water work between April 15 and June 15.
- Developing and coordinating a blasting plan, to include the use of an air curtain, with State and Federal resource agencies.
- Establishing and maintaining a net disposal receptacle at the harbor to reduce at-sea net disposal and the consequent impacts on fisheries.
- Clearing two local anadromous fish streams for 25 years to maintain sockeye salmon returns to spawning habitat.

Adverse environmental effects would include direct impacts to approximately 18.3 acres of marine habitat, the loss of eelgrass beds within the project footprint, minor increases in turbidity levels during periods of work, and a reduction in the net productivity of the site.

Harbor operations may contribute to water quality degradation because of incidental discharges of pollutants such as sewage, fuel, and fish wastes. Adoption and enforcement of ordinances to prevent these practices can minimize impacts. Water quality would be expected to remain high because of good circulation and flushing characteristics, which would prevent the accumulation of pollutants.

4.2 Economic Considerations

Economic considerations in the selection process included a comparison of the costs of the alternatives. Detailed cost estimates for the alternatives are listed in tables 4-2 and 4-3. Cost components include the costs of construction, engineering and design, supervision and administration, navigation aids, and interest during construction, based on a discount rate of 7-1/8 percent and a 9-month construction period. The project cost was reduced to an equivalent annual cost based on a project life of 50 years. To this was added the annual operation, maintenance, repair, replacement, and rehabilitation (OMRRR) cost to arrive at a total annual cost. This number was subtracted from the annual National Economic Development (NED) benefits to arrive at net NED benefits.

TABLE 4-2.--*Detailed cost estimate, alternative 1*
(October 1997 price level)

Item	Qty.	Unit	Unit price ($)	Shared NED costs ($000)[a] Federal	Local	TOTAL
Mobilization & demob.	1	LS	586,000	425	106	531
Breakwater						
Armor rock	29,100	yd^3	50	1,169	292	1,461
Secondary rock	21,300	yd^3	31	537	134	671
Core (quarry run)	74,100	yd^3	23	1,350	337	1,687
Entrance Protection	4,100	yd3	22	74	18	92
Hydrographic surveys	2	ea	19,300	31	8	39
Navigation aid foundation	2	ea	5,200	8	2	10
Entrance and access channel dredging						
Entrance channel	44,300	yd^3	21.73	770	193	963
Maneuvering channel	3,500	yd^3	12.91	36	9	45
Hydrographic survey	1	ea	19,300	15	4	19
Float system	1	LS	1,664,900		1,665	1,665
Utilities (power, lights)	1	LS	222,300		222	222
Moorage basin						
Dredge sand	31,000	yd^3	10.82		336	336
SUBTOTAL				4,341	3,308	7,741
Contingency				1,050	256	1,306
CONSTRUCTION CONTRACT				5,391	3,564	9,047
Lands and damages				70	50	120
Engineering and design				1,020	293	1,313
Supervision and administration				712	262	974
Navigation aids (U.S. Coast Guard)				8	0	8
TOTAL PROJECT COST				7,202	4,169	11,462
Total NED construction cost						11,462
NED interest during construction (7-1/8%, 9 mo.)[b]						454
NED investment cost						**11,916**
Annual NED cost ($)						**$877,000**
Annual O & M						**28,000**
Total annual NED cost						**$905,000**

[a] Features showing Federal costs are General Navigation Features. These can be paid in part by the Federal Government, subject to current cost-sharing laws.
[b] Includes $70,000 interest on PED.

Revised Sep 98

TABLE 4-3.--*Detailed cost estimate, alternative 2*
(October 1997 price level)

Item	Qty.	Unit	Unit price ($)	Shared NED costs ($000)[a] Federal	Local	TOTAL
Mobilization & demob.	1	LS	584,000	467	117	584
Breakwater						
Armor rock	30,600	yd^3	50	1,199	300	1,499
Secondary rock	23,600	yd^3	31	586	146	732
Core (quarry run)	94,600	yd^3	23	1,741	435	2,176
Hydrographic surveys	2	ea	19,300	31	7	38
Navigation aid foundation	2	ea	5,100	8	2	10
Entrance and access channel dredging						
Entrance channel	26,600	yd^3	26.68	568	142	710
Maneuvering channel	3,600	yd^3	13.11	38	9	47
Hydrographic survey	1	ea	19,200	15	4	19
Float system	1	LS	1,855,000		1,855	1,855
Utilities (power, lights)	1	LS	253,000		253	253
Moorage basin						
Dredge	40,200	yd^3	10.45		420	420
SUBTOTAL				4,653	3,690	8,343
Contingency				1,238	265	1,503
CONSTRUCTION CONTRACT				5,891	3,955	9,846
Lands and damages				49	0	49
Engineering and design				1,020	375	1,395
Supervision and administration				712	300	1,012
Navigation aids (U.S. Coast Guard)				8	0	8
TOTAL PROJECT COST				7,680	4,630	12,310
Total NED construction cost						12,310
NED interest during construction (7-1/8%, 9 mo.)[b]						491
NED investment cost						**12,801**
Annual NED cost ($)						**$920,000**
Annual O & M						**30,000**
Total annual NED cost						**$950,000**

[a] Features showing Federal costs are General Navigation Features. These can be paid in part by the Federal Government, subject to current cost-sharing laws.
[b] Includes $75,000 interest on PED.

Revised Sep 98

Because it maximizes net benefits, alternative 1 is designated the NED plan. The recommended plan is discussed in more detail in section 5. The economic benefits of an improved harbor at Sand Point, both national and regional, are discussed in detail in Appendix B, Economic Analysis.

4.3 Selection of Optimum Harbor Size

Annual benefits and annual costs for the two alternatives were analyzed to identify the most cost-effective configuration. Alternative 1, accommodating a fleet of 37 vessels, was selected based on this analysis. Incremental benefits are earned as protection is provided for additional vessels. These incremental benefits are used to determine the value of adding more slips in order to establish the NED plan.

The benefit evaluation assumed the largest trip savings would be the first realized. Under this approach, a benefit curve would result with smaller incremental benefits associated with larger-sized projects. It might be expected that the largest economic savings would be the first realized, and ordinarily benefit curves mirror the idea of diminishing returns. In this situation it is unlikely that would be the case, for the following reasons:

a. The vessels that are candidates for trip savings are under different ownership, so decisions regarding where they would be moored are not centrally coordinated.

b. Moorage becomes available according to seniority, and the seniority is established on a first-come, first-served basis.

c. Use of the lowest-cost alternative would happen in every case if there were perfect information flow between all harbors and all moorage customers. There is no formal or informal information system meeting this need.

d. A least-cost moorage alternative that is available on one day may not be available by the time customers arrive seeking space.

e. Unless long-term moorage arrangements are made, vessel owners are unable to predict where the vessel might be moored at any specific time.

f. Vessel owners operate with a season plan but are not able to pinpoint exactly where a vessel may be tied up, so vessel moorage becomes random with broad regional constraints.

It is therefore suggested that the report benefits and maximization be based on the assumption that the ratio of boats traveling to alternative ports would remain the same for any size harbor at Sand Point.

In table 4-4, the benefits and costs for harbors accommodating varying numbers of vessels are compared.

TABLE 4-4.--*Harbor size optimization*

Item	Number of vessel slips		
	25	37	42
Investment cost	$9,947,000	$11,455,000	$13,690,000
Ave. annual cost	$755,000	$877,000	$1,039,000
Annual benefits	$1,477,000	$1,739,000	$1,791,000
Net benefits	$722,000	$862,000	$752,000

4.4 Optimization of Entrance Channel and Moorage Basin Depth

The alternative identified as the National Economic Development plan must, by Federal policy, have the greatest net benefits. Costs and benefits of an excavated channel vary with its depth, so increases in cost for added channel depth must be incrementally compared to the corresponding increases in benefits. This section describes the analyses undertaken to identify the NED plan.

The channel depth was optimized by comparison of the life-cycle costs for increments of increasing depth from –16 to –19 ft MLLW. This comparison is seen in table 4-5. Annual costs are subtracted from corresponding total annual benefits for each level of access to the harbor by commercial fishing vessels. The net benefits presented in the table demonstrate the NED channel depth as –18 ft MLLW, in terms of maximum net benefits.

TABLE 4-5.--*Comparison of costs and benefits for various channel depths*

Channel depth (ft MLLW)	First cost	Annual cost	Annual benefit	Net benefits
-16	$10,960,000	$807,000	$1,539,000	$732,000
-17	$11,161,000	$822,000	$1,617,000	$795,000
-18	$11,455,000	$843,000	$1,739,000	$896,000
-19	$11,619,000	$855,000	$1,739,000	$884,000

Design criteria for the entrance depth are as follows:

a. Unloaded draft of design vessel, 11.5 ft; beam, 34 ft

b. Pitch, roll and heave of 2.7 ft, based on two-thirds of the significant wave height in the channel

c. Safety clearance, 3 ft

d. Low tide, -1.5 ft MLLW

e. Squat = .6 ft

These criteria also result in an entrance channel bottom elevation of –18 ft MLLW.

The proposed moorage basin depth was determined based on:

a. Unloaded draft of design vessel, 11.5 ft; beam, 34 ft

b. Safety clearance, 2 ft

c. Extreme low tide, -3.6 ft MLLW

These criteria result in a moorage basin bottom elevation of –17 ft MLLW. The minimum tide level was used due to the requirement that vessels remain and maneuver in the harbor regardless of tide level.

5. DESCRIPTION OF RECOMMENDED PLAN

5.1 Plan Components

The recommended plan, alternative 1, was pictured in figure 5. A new harbor would be created south of the existing harbor, providing 37 slips for vessels 80 to 150 feet in length.

5.1.1 Rubblemound Breakwater.

A 570-foot-long rubblemound breakwater would be extended from the south breakwater of the existing harbor to form the northwest side of the harbor and the eastern side of the entrance channel. Maximum depth of water is –35 ft MLLW along the alignment of the breakwater. A 730-foot-long breakwater would be constructed from shore, extending northwest to a depth of approximately –15 feet MLLW, where it would change to a north-south alignment to form the western side of the entrance channel. Foundation materials are sand, gravel, and cobbles, which would serve as a suitable base for the rubblemound structure.

Armor stone with a range of sizes from 1,900 to 3,200 lb would be used on the sea-side face of the breakwater. Secondary stone would range from 200 to 1,900 lb. Core material would be 1 to 200 lb. Armor stone layer thickness would be 5.0 ft, and secondary stone layer thickness would be 2.5 ft.

5.1.2 Channels and Basin.

The entrance channel is designed to accommodate one-way traffic for a vessel 150 feet long, with a beam of 34 feet and an unloaded draft of 11.5 feet. The entrance channel has a minimum bottom width of 120 feet, with additional width in the channel turn increasing to 230 feet (1.5 ∈ design vessel length). This would allow for adequate maneuverability and clearance on either side of the breakwaters. The area of the entrance channel is approximately 2.9 acres. Dredging of 44,300 yd^3 in the entrance channel is required to obtain a depth of –18 ft MLLW throughout. Table 5-1 shows how the dredged depths for the harbor were calculated.

TABLE 5-1.—*Calculation of dredged depths for Sand Point Harbor*

Item	Entrance channel[a]	Access channel and mooring basin[b]
Design draft	11.5 ft	11.5 ft
Design vessel squat	.6 ft	N/A
Safety clearance	3.0 ft	2.0 ft
Allowance for wave height	2.7 ft	0
Allowance for tide	0	3.6 ft
TOTALS	**18 ft**	**17 ft**

[a]Exposed to 4-ft wave. [b]Exposed to <1-ft wave.

5.1.3 Staging Area and Disposal of Dredgings.

Approximately 78,800 yd^3 of material would be dredged for construction of the preferred alternative. Approximately 56,200 yd^3 would be discharged along the shoreline of the new basin to construct a 2.7-acre storage/access area. Dredged material remaining would be discharged along the shoreline of the existing basin (6,300 yd^3) and within the proposed harbor at depths in excess of –20 feet MLLW (16,300 yd^3). The city of Sand Point possesses the required Section 10 and Section 404 permits for disposal at the existing harbor.

5.2 Plan Benefits

Benefits of the NED plan are presented in table 5-2. Details of the benefit calculations are in Appendix B, Economic Analysis. Annual benefits are estimated to be $1,739,000, and the benefit/cost ratio is 2.0.

TABLE 5-2.--*Summary of annual benefits*

Benefit category	Amount
Travel-related benefits	$1,700,000
Rafting-related benefits	39,000
Total annual benefits	$1,739,000

5.3 Plan Costs

The NED construction cost of the project is estimated at $11,463,000, which includes $8,000 for navigational aids to be paid by the U.S. Coast Guard. Adding $454,000 for interest during construction brings the NED investment cost estimate to $11,917,000.

The annual NED cost (7-1/8 percent interest, 50-year project life, October 1997 price level) is $877,000. Details of the cost of the recommended plan are listed in table 4-2 in the preceding section and in appendix E.

Interest during construction (IDC) is added to the first cost to account for the opportunity cost incurred after the funds have been spent, but before the benefits begin to accrue. IDC is calculated by matching the construction expenditure flow with the interest the funds would have accumulated had they been deposited in an interest-bearing account. Construction is expected to last 9 months. For this analysis, level monthly expenditures are assumed: 12 payments of $960,500 each. The monthly interest rate is .0059375. Total interest during construction is $454,000.

First cost of the recommended plan, including plans and specifications (P&S), is $11,455,000. Interest on the P&S cost of 1,313,000 for 9 months at 7.125 is $70,000. Interest on plans and specifications is added to the first cost before calculating IDC. The IDC for the first cost of $11,525,000 ($11,603,000 + $70,000) is $384,000. The first cost plus IDC equals $11,839,000. The annual cost equals $871,000.

5.4 Risk and Uncertainty

As in any planning process, some of the assumptions made in this report are subject to error. Elements of risk and uncertainty could affect the harbor design, cost, and/or benefits. Table 5-3 provides a brief summary of the parameters most subject to uncertainty. A risk and uncertainty analysis is included in Appendix B, Economic Analysis.

TABLE 5-3.--*Elements of risk and uncertainty*

Parameter	Assumption	Refer to
Benefits	Based on expert opinion, interviews, and experience with other harbors. Subject to considerable interpretation. The operating costs and the number of vessels are the factors most subject to uncertainty.	Appendix B
Cost of quarried rock	Dependent on quarry location selected by contractor. Cost estimate assumes nearest operating quarry, then includes 20 percent contingency.	Table 4-3
Design wave	50-year design wave based on available wind data for Sand Point and applying methods in the SPM and EM's.	Appendix A
Dredging costs	Geophysical study indicates presence of hard material. Therefore, worst-case conditions were used in the cost estimate.	Appendix A

5.5 Plan Accomplishment

The recommended plan would meet the planning objectives for Sand Point in the following ways:

a. Provide year-round, convenient moorage for 37 large commercial vessels.

b. Reduce the considerable costs for fuel and vessel maintenance associated with transporting vessels annually to alternative ports.

c. Reduce lost opportunity costs and improve the local economy by providing vessel availability on a year-round basis for vessels in excess of 80 feet, including short-term vessel use during adverse weather.

d. Provide a harbor of refuge for transient vessels.

e. Preserve environmental resources to the maximum level consistent with maximizing NED net benefits and other objectives; and

f. Provide employment during harbor construction in the Sand Point area, which has persistent unemployment.

5.6 Plan Implementation

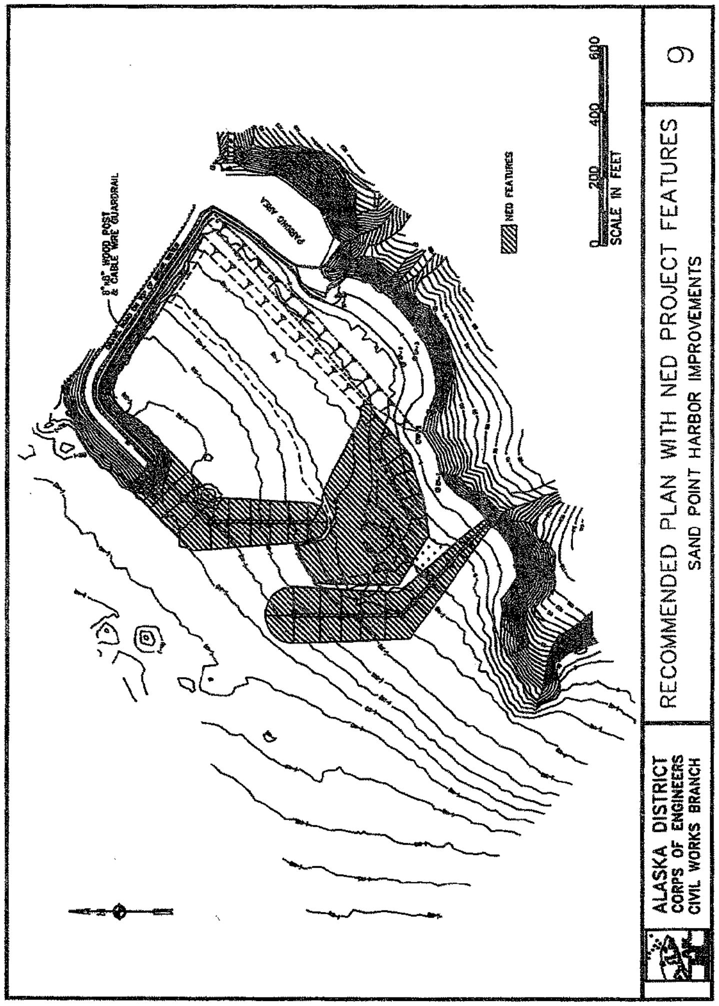
5.6.1 Construction.

Federal. The Corps of Engineers would be responsible for construction of the breakwater and entrance channel. The U.S. Coast Guard would be responsible for installing the navigation aids. The NED project features that could be financed in part by the Federal Government are shown in figure 9.

Local. The local sponsor would be responsible for excavating the mooring basin, constructing the float system, and providing all lands, easements, and rights-of-way necessary for the project. The local sponsor would also be responsible for utility service to the harbor and for funding its share of the Federal major navigational items (general navigation features).

5.6.2 Operation, Maintenance, and Replacement (OM&R).

Federal. The Corps of Engineers would maintain the breakwater and channels as needed and would conduct periodic hydrographic surveys to determine if


RECOMMENDED PLAN WITH NED PROJECT FEATURES
SAND POINT HARBOR IMPROVEMENTS
9
ALASKA DISTRICT
CORPS OF ENGINEERS
CIVIL WORKS BRANCH
NED FEATURES
0 200 400 600
SCALE IN FEET
PARKING AREA
8"x8" WOOD POST & CABLE WIRE GUARDRAIL

or when maintenance dredging is required. The U.S. Coast Guard would maintain navigational aids. Dredging material could be deposited in upland disposal areas for use as fill material or in the ocean at sites discussed in the EA. (The Federal Government must be held free from responsibility or cost in connection with the upland disposal site.) Table 5-4 indicates OM&R intervals and costs.

TABLE 5-4.--*Annual NED costs of operation, maintenance, and replacement (OM&R), recommended plan*

Item	Interval	EQUIVALENT ANNUAL COSTS ($) Corps	Other Fed.	Local	Total
Breakwater					
Replace 5% of armor	15 yr	2,400			2,400
Hydrographic surveys	4 yr	2,400			2,400
Maintain navigation aids	5 yr		600		600
Float system					
Maintain floats, stalls, & piles	1 yr			4,000	4,000
Replace floats, stalls, & piles	30 yr			18,000	18,000
TOTAL OM&R COSTS		$4,800	$600	$22,000	$27,400

Local. The local sponsor would perform maintenance dredging of the mooring boat basin if necessary, maintain the floats, utilities, etc., and operate the completed project. The local sponsor may use dredged material for approved fill activities or other construction activities.

5.6.3 Real Property Interests.

The sponsor would provide all lands necessary for the project. The land requirements anticipated for the Federal portion of the project are (1) a permanent easement for a breakwater tie-in, (2) a temporary work area easement, (3) a temporary easement for a disposal area, and (4) a temporary staging area. All temporary easements are for 2 years. It is recommended that the non-federal sponsor acquire fee title to the upland disposal site, as it will become a parking area for the boat harbor. The remaining portions of the project lie below Mean High Water. Tidelands are owned by the city of Sand Point. Public access is currently available to the project site. No relocations of public utilities nor any P.L. 91-646 relocations are anticipated. The sponsor would require 90 to 120 days to acquire and certify all lands, easements, rights-of-way, utility relocations, and dredge spoil disposal areas (LERRD). Table 5-5 indicates the areas and interests that would be required for the project features.

TABLE 5-5.--*Land interests required for essential portions of project*

Feature	Acres	Owner	Interest	GNF*/ local
Entrance channel, turning basin (below Mean High Water)	6.70	City of Sand Point Tidelands	Navigational servitude	GNF
Breakwater (below Mean High Water)	4.00	City of Sand Point Tidelands	Navigational servitude	GNF
Breakwater (above Mean High Water)	0.09	Private	Permanent easement Standard Estate #9	GNF
Disposal area (below Mean High Water)	1.48	City of Sand Point Tidelands	Navigational servitude	GNF
Disposal area (above Mean High Water)	1.28	Private	Temporary easement Standard Estate #15	GNF
Work and staging areas	4.14	Private	Temporary easement Standard Estate #15	GNF
Mooring basin (below Mean High Water)	4.91	City of Sand Point Tidelands	Permanent easement	Local

* General Navigation Features (Federal portions of project).

Table 5-6 lists the project's real estate costs for both the Federal and the non-federal portions. The sponsor's ability to acquire the necessary real estate is assessed in appendix F.

TABLE 5-6.--*Real estate costs (October 1997 price level)*

Federal project portions (GNF)

Item	Federal	Local	Subtotal	Total
Administration	$5,000	$10,000	$15,000	
Payments for real estate	0	$55,000	$55,000	$70,000

Non-federal project portions

Item	Federal	Local	Subtotal	Total
Administration	0	$5,000	$5,000	
Payments for real estate	0	$45,000	$45,000	$50,000

1.1.1 Cost Apportionment

Construction costs for the project would be apportioned in accordance with the Water Resources Development Act of 1986. The fully funded cost apportionment for project features is summarized in table 5-7.

TABLE 5-7.—*Apportionment of construction costs*

Portion of project	Construction cost contribution (%) Federal	Local
General navigation features (includes entrance channel, maneuvering basin, & breakwater)	80	20[a]
Local features (includes floats & mooring basin)	0	100
Coast Guard navigation aids	100	0

[a] Non-federal interests must provide cash contributions toward the costs for construction of the general navigation features (GNF) of the project, paid during construction (PDC) as follows: for project depths of up to 20 ft--10%; for project depths over 20 ft and up to 45 ft--25%, and for project depths exceeding 45 ft--50%. For all depths, they must provide an additional cash contribution equal to 10% of GNF costs (which may be financed over a period not exceeding 30 years), against which the sponsor's costs for LERRD (except utilities) shall be credited.

Note: Costs for general navigation features include associated costs, such as mobilization.

The initial construction cost of the General Navigation Features is 80 percent for the initial Federal investment and 20 percent for the initial local share. (These percentages apply to all aspects of the project except dredging that portion of the maneuvering basin that is less than 20 feet deep; the initial Federal share is 90 percent of the cost of this portion. The non-federal sponsor must also contribute an additional 10 percent, plus interest, during a period not to exceed 30 years after completion of the General Navigation Features. The sponsor would be credited toward this 10-percent cost with the value of LERRD necessary for construction, operation, and maintenance of the general navigation features. The sponsor is also responsible for 100 percent of the construction cost of the inner harbor facilities, which includes dredging the mooring area.

The Federal Government would assume 100 percent of the operation and maintenance costs for the breakwater and entrance channel. The non-federal sponsor would assume all other operation and maintenance costs. The sponsor would be responsible for providing LERRD for construction and future maintenance of the inner harbor facilities.

In addition to the sponsor's share of costs for General Navigation Features, the sponsor is responsible for costs associated with other NED and non-NED features. The Pertinent Data table in the front of this report provides a summary of all shared costs.

Revised Sep 98

1.1.2 Financial Analysis.

The Aleutians East Borough is considering a combination of General Obligation bonds and revenue bonds to finance the local share of project costs. The borough is able to issue debt because of its Permanent Fund, in which 15 percent of fish tax revenues are deposited each year. Borough Administrator Robert Juettner explains the borough's financial capability in a letter dated January 13, 1998, included in appendix G. Revenue would come from raising moorage fees on the increased number of vessel slips.

The borough's financial plan and the Corps' assessment of that plan are included in appendix H.

1.2 Public Involvement

At a series of public meetings, residents of Sand Point responded in favor of the construction of additional harbor space for the community.

Since initiation of this feasibility study, the city manager and mayor, along with representatives from the Aleutians East Borough, have worked closely with the study team, and local concerns have been addressed. Cooperation between the staffs of the Corps of Engineers and the ADOT&PF, together with input from the city of Sand Point, resulted in the recommended plan. The Sand Point community and local residents have stated their preference for the alternative recommended in this report, which is also the NED plan.

1.3 Consultation Requirements

This study has been coordinated with all relevant Federal and State agencies, including the U.S. Fish and Wildlife Service. Information on this coordination is provided in the draft EA. Pertinent correspondence is presented in EA appendix 2 and in appendix G. The harbor plans will be in full compliance with each requirement when the final EA is accepted.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The studies documented in this report indicate that Federal construction of navigational improvements with a rubblemound breakwater, as described in the recommended plan, is technically possible, economically justified, and environmentally and socially acceptable. This plan was found to be the best for maximizing net benefits; thus it was designated the NED plan. The Aleutians East Borough is willing to act as local sponsor for the project and fulfill all the necessary local cooperation requirements. Thus it is concluded that alternative 1, the recommended plan, should be pursued by the United States in cooperation with the Aleutians East Borough.

6.2 Recommendations

I hereby recommend that the navigational improvements at Sand Point, Alaska, be constructed as described in the recommended plan in this report with the Federal Government contributing a first cost of $7,181,000, plus $8,000 worth of navigation aids to be provided by the U.S. Coast Guard, and $5,400 annually for Federal maintenance, including $600 for maintaining navigation aids, provided that prior to construction the local sponsor agrees to:

a. Provide and maintain, at its own expense, the local service facilities, consisting of the mooring basin and the mooring facilities.

b. Provide all lands, easements, rights-of-way, and perform or ensure the performance of all relocations determined by the Federal Government to be necessary for the construction, operation, maintenance, repair, replacement, and rehabilitation of the general navigation features (including all lands, easements, and rights-of-way, and relocations necessary for dredged material disposal facilities) and the local service facilities.

c. Provide, during the period of construction, a cash contribution equal to the following percentages of the total cost of construction of the general navigation features which include the construction of land-based and aquatic dredged material disposal facilities that are necessary for the disposal of dredged material required for project construction, operation, or maintenance and for which a contract for the facility's construction or improvement was not awarded on or before October 12, 1996:

(1) 10 percent of the costs attributable to dredging to a depth not in excess of 20 feet;

(2) 25 percent of the costs attributable to dredging to a depth in excess of 20 feet but not in excess of 45 feet;

Revised Sep 98

(3) 50 percent of the costs attributable to dredging to a depth in excess of 45 feet.

e. Repay with interest, over a period not to exceed 30 years following completion of the period of construction of the Project, an additional 0 to 10 percent of the total cost of construction of general navigation features depending upon the amount of credit given for the value of lands, easements, rights-of-way, relocations, and borrow and dredged or excavated material disposal areas provided by the Non-Federal Sponsor for the general navigation features. If the amount of credit exceeds 10% of the total cost of construction of the general navigation features, the Non-federal Sponsor shall not be required to make any contribution under this paragraph, nor shall it be entitled to any refund for the value of lands, easements, right-of-way, relocations, and dredged or excavated material disposal areas, in excess of 10% of the total cost of construction of the general navigation features.

f. For so long as the Project remains authorized, operate and maintain the local service facilities and any dredged or excavated material disposal areas, in a manner compatible with the Project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government.

g. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the Non-Federal Sponsor owns or controls for access to the general navigation features for the purpose of inspection, and, if necessary, for the purpose of operating and maintaining the general navigation features.

h. Hold and save the United States free from all damages arising from the construction, operation, and maintenance of the Project, any betterments, and the local service facilities, except for damages due to the fault or negligence of the United States or its contractors.

i. Keep, and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the Project, for a minimum of three years after completion of the accounting for which such books, records, documents, and other evidence is required, to the extent and in such detail as will properly reflect total cost of construction of the general navigation features, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 CFR Section 33.20.

j. Perform, or cause to be performed, any investigations for hazardous substances as are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601-9675, that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the construction, operation, and maintenance of the general navigation features. However, for lands that the Government determines to be subject to the navigation servitude, only the Government shall perform such investigations unless the Federal Government provides the Non-Federal Sponsor with prior specific written direction, in which case the Non-Federal Sponsor shall perform such investigations in accordance with such written direction.

k. Assume complete financial responsibility, as between the Federal Government and the Non-Federal Sponsor, for all necessary cleanup and response costs of any CERCLA-regulated materials located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be necessary for the construction, operation, or maintenance of the general navigation features.

l. To the maximum extent practicable, perform its obligations in a manner that will not cause liability to arise under CERCLA.

m. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way, required for construction, operation, and maintenance, of the general navigation features, and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act.

n. Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 USC 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army".

o. Provide a cash contribution equal to the following percentages of total historic preservation mitigation and data recovery costs attributable to commercial navigation that are in excess of one percent of the total amount authorized to be appropriated for commercial navigation:

(1) 10 percent of the costs attributable to dredging to a depth not in excess of 20 feet;

(2) 25 percent of the costs attributable to dredging to a depth in excess of 20 feet but not in excess of 45 feet;

(3) 50 percent of the costs attributable to dredging to a depth in excess of 45 feet.

p. Enter into an agreement which provides, prior to construction, 25 percent of preconstruction engineering and design (PED) costs;

q. Provide, during construction, any additional funds needed to cover the non-federal share of PED costs;

r. Accomplish all removals determined necessary by the Federal Government other than those removals specifically assigned to the Federal Government.

The recommendations for implementation of harbor improvements at Sand Point, Alaska, reflect the policies governing formulation of individual projects and the information available at this time. They do not necessarily reflect the program and budgeting priorities inherent in the local and State programs or the formulation of a national civil works water resources program. Consequently, the recommendations may be changed at higher review levels of the executive branch outside Alaska before they are used to support funding.

LTC, EN

Date: 21 APR 98

CHRISTOPHER M. TURLETES
Lieutenant Colonel, Corps of Engineers
Acting District Engineer

REFERENCES

U.S. Army Corps of Engineers (USACE). 1984. *Shore Protection Manual.*

USACE, Alaska District. 1995. (Jul). "Reconnaissance report for boat harbor improvements, Sand Point, Alaska," Anchorage.

Other pertinent reports are described in section 1.4, Related Reports and Studies.

ENVIRONMENTAL ASSESSMENT

AND

FINDING OF NO SIGNIFICANT IMPACT

SAND POINT
NAVIGATION IMPROVEMENTS
SAND POINT, ALASKA

January 1998

SAND POINT
NAVIGATION IMPROVEMENTS
SAND POINT, ALASKA

CONTENTS

TABLES

APPENDIXES

FINDING OF NO SIGNIFICANT IMPACT

In accordance with the National Environmental Policy Act of 1969, as amended, the U.S. Army Corps of Engineer District, Alaska, has assessed the environmental effects of the following action:

Sand Point
Navigation Improvements
Sand Point, Alaska

Humboldt Harbor in Sand Point, Alaska, is being expanded to satisfy additional moorage needs. The harbor improvements, referred to as alternative 1 and described in the January 1998 environmental assessment, will be constructed at the Black Point site. Work will entail (1) extending the existing south breakwater/city dock to the southwest; (2) constructing a new rubblemound breakwater northward from the shoreline near Black Point; (3) dredging a mooring basin, entrance channel, and a fairway; and (4) constructing a 2.7-acre storage/access area. Approximately 78,800 cubic yards (yd^3) of material will be dredged to construct the mooring basin, entrance channel, and fairway. Approximately 183,500 yd^3 of fill material (consisting of armor rock, secondary rock, core material, and dredged material), will be discharged to construct the breakwaters and the storage/access area, and to protect the side slopes of the entrance channel. Dredged material not used to construct the storage/access area will be discharged along the shoreline of the existing harbor (about 6,300 yd^3) and in water depths greater than -20 feet Mean Lower Low Water within the harbor (16,300 yd^3). Inner harbor facilities, initially consisting of finger floats and walkways, will be installed by the local sponsor, the Aleutians East Borough.

Construction of the harbor improvements will not contribute substantially to the future growth of Sand Point; although, it will provide employment opportunities during construction and will provide space for 37 large commercial fishing vessels. Adverse environmental effects will include direct impacts to approximately 18.3 acres of marine habitat, the loss of eelgrass beds within the project footprint, minor increases in turbidity levels during periods of work, and a reduction in the net productivity of the site.

Work will not affect any sites eligible for inclusion in the National Register of Historic Places. The project also will not affect any threatened or endangered species or their critical habitat. These determinations have been coordinated with the State Historic Preservation Office, the U.S. Fish and Wildlife Service (USFWS), and the National Marine Fisheries Service (NMFS).

All appropriate and practicable mitigation measures have been incorporated into the project and include (1) designing the harbor to maximize the number of vessels it can safely accommodate, while minimizing the project footprint; (2) constructing the breakwater prior to dredging the basin to help contain any sediment plume; (3) using a silt curtain for in-water work between April 15 and June 15; (4) coordinating construction of the harbor with the city of Sand Point and the Aleutians East Borough to avoid conflicts with subsistence activities; (5) preparing a quarry development plan to be reviewed by State and Federal resource agencies; (6) complying with Alaska Department of Fish and Game (ADF&G) standard blasting stipulations; and (7) developing and coordinating a blasting plan, to include the use of an air curtain, with ADF&G, USFWS, and NMFS. Compensatory mitigation will be implemented to further minimize project impacts and will be as follows: (1) a net disposal receptacle will be maintained at the harbor to reduce at-sea net disposal and the consequent impacts on fisheries; (2) development and implementation of an outreach/educational program to encourage local fishermen to discard nets properly; (3) a used oil recycling program will encourage proper disposal of engine oil; and (4) two local anadromous fish streams will be cleared each year for 25 years to maintain sockeye salmon returns to spawning habitat.

The action is consistent with State and local coastal zone management programs to the maximum extent practicable. The Sand Point Navigation Improvements environmental assessment supports the conclusion that the project does not constitute a major Federal action significantly affecting the quality of the human environment. Therefore, an environmental impact statement is not necessary to construct the navigation improvements in Sand Point, Alaska.

Sheldon L. Jahn
Colonel, Corps of Engineers
District Engineer

24 APR 98
Date

ENVIRONMENTAL ASSESSMENT

SAND POINT
NAVIGATION IMPROVEMENTS
SAND POINT, ALASKA

1. PURPOSE AND NEED OF THE PROPOSED ACTION

The purpose of the proposed action is to provide additional moorage space for vessels 80 to 150 feet in length at Sand Point, Alaska. An analysis of the existing and projected moorage demand at Sand Point determined a need for additional moorage space for 63 commercial fishing vessels greater than 80 feet in length (see section 3.0 in the Economic Analysis, appendix B). Of these vessels, 21 are seeking permanent spaces and 42 are seeking transient spaces. A plan optimization determined that 37 slips maximized net benefits and is therefore the National Economic Development (NED) plan.

Sand Point is a commercial fishing community on the northwestern shore of Popof Island in the Shumagin Island Group off the southwestern Alaska Peninsula (see figure 1 in the main report). Vessels use Sand Point facilities to obtain provisions, for crew rotations, for moorage during closed fishing periods, and for protection during adverse weather conditions. Excess demand for harbor services and facilities, especially for transient vessels over 80 feet in length, occurs during peak periods. Overcrowded harbors increase the likelihood of vessel damage, personal injury, and fire. Commercial enterprises that depend on harbor facilities and services experience inefficiencies and, ultimately, loss of income when a harbor does not run smoothly because of overcrowding.

Proposed improvements are authorized under the continuing authority provided by Section 107 of the Rivers and Harbors Act of 1960 (Public Law 86-645), as amended. Section 107 provides continuing authority for the Chief of Engineers to plan and construct small navigation projects not specifically authorized by Congress.

2. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 No-Action Alternative

The no-action alternative would leave the site in its present condition. The identified purpose and need would not be fulfilled. The harbor would continue to be used beyond its designed capacity. Damage to vessels and docking facilities from overcrowding would continue; economic benefits to the fleet from improved and expanded harbor facilities would not be achieved; and vessels unable to secure moorage in the existing harbor would continue seeking refuge at other ports.

2.2 Alternative Sites Eliminated From Further Study

Alternatives considered to fulfill the project purpose and need included rearranging the existing harbor facilities, expanding the existing harbor, or constructing a new harbor at Mud Bay, Popof Cove, or Sand Point Spit. These alternatives were rejected as being impracticable, having a benefit-cost ratio less than one, not fulfilling the project purpose and need, and/or having unacceptable environmental impacts.

2.2.1 Reconfigure Existing Harbor Facilities.

Two reconnaissance reports for harbor improvements at Sand Point (USACE, 1995 and 1996a) evaluated a number of alternatives to accommodate the current fleet, including rearranging the existing inner harbor facilities. During the preparation of these reports, it was discovered that the city of Sand Point had already reconfigured the harbor to accommodate as many vessels as safely possible. Therefore, rearranging the existing harbor facilities was eliminated from further study.

2.2.2 Mud Bay.

Mud Bay, about 1.5 miles north of the existing harbor, is sheltered by Range Island and two headlands, as shown in figure 4 of the main report. The potential basin area for this site (up to 40 acres) is the largest among the proposed alternatives. The average bottom elevation is less than -6 feet Mean Lower Low Water (MLLW). Therefore, substantial dredging would be required to develop the site. Based on a 23-acre basin and an entrance channel with a design depth of -17 feet MLLW, the dredging quantity would be in excess of 400,000 cubic yards (yd^3). Concerns with use of this site include identifying an acceptable disposal site for 400,000 yd^3 of material, the presence of extensive eelgrass beds (a special aquatic site), residential zoning, and lack of existing infrastructure.

2.2.3 Popof Cove.

Popof Cove is about a mile northwest of the existing harbor as shown in figure 4 of the main report. A 27-acre basin could be created by constructing breakwaters. As with Mud Bay, substantial dredging would be required to obtain a design depth of -17 feet MLLW. Another concern involves the fact that most of the property surrounding the site is residential, and local residents and city officials have spoken out strongly against harbor development at this location.

2.2.4 Sand Point Spit.

The Sand Point Spit site is roughly 1.25 miles south of the existing harbor near the airport, as shown in figure 4 of the main report. Extreme water depths at this site greatly limit the size of the harbor and the practicality of building a rubblemound breakwater. At about 300 feet offshore, water depths approach -70 feet MLLW. Construction of a rubblemound breakwater at these depths would be difficult and would require large quantities of fill material. Real estate issues are also a major concern at this site.

2.3 Preferred Site (Black Point)

The preferred alternative is to construct a harbor at Black Point, immediately south of the existing harbor. The existing south breakwater would be incorporated into the harbor design, minimizing breakwater construction. Use of the site is strongly supported by the city and borough, primarily because it would keep all the harbor facilities at a centralized location. The Federal portion of the project would include construction of the entrance channel and rubblemound breakwaters. Construction and installation of inner harbor facilities would be the responsibility of the local sponsor, the Aleutians East Borough. Inner harbor facilities would initially consist of finger floats and walkways. Two alternative designs for construction at the Black Point site are evaluated in detail below. Alternative 1 was chosen as the preferred alternative design (proposed action) as discussed in section 4.3.

2.3.1 Alternative 1.

Alternative 1, as shown in figure 5 of the main report, would accommodate approximately 37 vessels up to 150 feet in length and would have a footprint of 18.3 acres. The existing south breakwater/city dock would be extended about 570 feet to the southwest, and a new approximately 730-foot-long rubblemound breakwater would be constructed northward from the shoreline near Black Point. Around 124,500 yd^3 of material would be discharged to construct the breakwaters (about a 4-acre footprint). Breakwaters would be constructed on a 1 vertical:1.5 horizontal slope.

The entrance channel, mooring basin, and fairway would be about 11.6 acres. Approximately 78,800 yd^3 of material would be dredged from 7.25 acres. The basin would be dredged to a design depth of -17 MLLW and the entrance channel to –18 feet MLLW. Dredging would likely be done by a clamshell dredge and excavator; however, the actual method would be up to the contractor. In-water blasting of rock (5,400 yd^3) is expected to be necessary. The side slopes of the entrance channel would be stabilized by roughly 2,750 yd^3 of armor rock.

Approximately 56,200 yd^3 of the dredged material would be discharged along the shoreline of the new basin to construct a 2.7-acre storage/access area. Storage/access areas are an integral part of harbor design and are required to support harbor-related activities. The area's topography limits the siting of a storage/access area adjacent to the proposed basin. The high tide line is located at the toe of the hillside; therefore, storage areas can only be created by either excavating into the hillside or filling intertidal areas. Excavating into the hillside would require extensive amounts of work, including blasting rock. Dredging and filling the intertidal area to meet design criteria was balanced against the need to minimize potential adverse environmental effects and the amount work needed. Dredged material remaining after creation of the 2.7-acre storage/access area, would be discharged along the shoreline of the existing harbor (6,300 yd^3) and within the proposed harbor at depths in excess of –20 feet MLLW (16,300 yd^3). The city of Sand

Point possesses the required Section 10 and Section 404 permits for disposal at the existing harbor (see Corps permit file number Humboldt Harbor 1, 2-870188, and subsequent modifications).

2.3.2 Alternative 2.

Alternative 2 would accommodate the same number of vessels as Alternative 1 (37); however, the total footprint of the harbor would be approximately 21 acres (see figure 7 in the main report). Increases in the size of the fairway and the storage/access areas account for most of the size increase. With this design, the existing south breakwater would be extended 980 feet to the southwest and would form the northwest breakwater of the new basin. A 370-foot breakwater would extend northwest from the shoreline and would be within the area enclosed by the "new" northwest breakwater. Approximately 148,750 yd^3 of material would be discharged for breakwater construction (about a 4-acre footprint). Breakwaters would be constructed on a 1 vertical:1.5 horizontal slope.

The entrance channel, mooring basin, and fairway would be approximately 13.2 acres. A total of approximately 70,400 yd^3 of material would be dredged from an 8-acre area. The basin would be dredged to a design depth of –19 feet MLLW and the entrance channel to –18 feet MLLW. Dredging would likely be done by clamshell dredge and excavator; however, the actual method would be left up to the contractor. In-water blasting of rock (about 4,650 yd^3) is expected to be required.

Most of the dredged material would be discharged along the shoreline to construct a 3.7-acre storage/access area (65,300 yd^3). The remainder of the material would be discharged along the shoreline of the existing harbor or in deeper water within the proposed basin.

2.3.3 Maintenance Dredging.

Based on conditions at the existing harbor and an evaluation of the littoral transport process in the area, maintenance dredging at the Black Point site is expected to be minor. Since the existing harbor was constructed in 1976, it has only been dredged once (approximately 817 yd^3 in 1993). The potential for shoaling in the entrance channel of alternative 2 is slightly greater than with alternative 1 due to the shallower surrounding areas and greater exposure of the channel to wave conditions. An estimated 1,000 yd^3 of material would be removed every 18 years with alternative 1, while an estimated 1,900 yd^3 of material would likely be removed every 12 years with alternative 2.

2.4 Breakwater Material Source

Breakwater materials would likely come from Dome Quarry, located immediately east of Black Point. However, the material source would not be designated by the Corps of Engineers. The contractor would be responsible for selecting a quarry site and providing rock to meet design specifications. Pre-project planning, including National Environmental Policy Act investigations and documentation, assumes that the construction contractor would use only an existing quarry as a rock source. Borrow materials (gravel, sand, classified material, etc.) would continue to come from sites designated by the government or from a permitted borrow source. A rock quarry is considered to be existing if there has ever been mining at the site, and it has not been restored. An existing quarry may be "operating" or "non-operating" (abandoned, idle, not currently used).

Upon selection of a quarry site, the contractor would submit a quarry development plan for that site to the Corps of Engineers for review. A coordinated agency review of the plan would be conducted, thus providing the opportunity for State and Federal agencies to place stipulations on the use of the site. The development plan would include limits of construction, disposal of quarry waste, necessary access roads and traffic routes, quarry rock stockpile area(s) and other stockpile areas for material to be used for quarry restoration. Other requirements include a blasting plan, an outline of excavation methods, and restoration plan.

3. AFFECTED ENVIRONMENT

3.1 Community Profile

Sand Point is 90 miles east of Cold Bay, 350 miles to the southeast of Kodiak and 570 miles southeast of Anchorage, as shown in figure 1 of the main report. Transportation to and from Sand Point is by air and sea only. There is no road access to the community. Sand Point is a mixed Native and non-Native community, with a population of 1,031 full-time residents. Trident Seafoods supports a large transient population during peak fishing periods. Many of the permanent residents have a heritage of mixed Aleut and European descent. There is also a strong representation from Scandinavian countries as well as Russia and Germany (City of Sand Point).

Sand Point is a First Class City under Title 29 of the Alaska State Statutes, with a mayor/council form of government. It is within the Aleutians East Borough, which also includes the communities of Akutan, Cold Bay, False Pass, King Cove, and Nelson Lagoon. Sand Point is home to the largest fishing fleet in the Aleutian Chain. Most of the economic opportunities in Sand Point are tied to the fishing industry. Commercial airlines, stores, restaurants, and government agencies also provide employment opportunities (Alaska Department of Community & Regional Affairs Community Database, 1996). Additional economic information may be obtained in the Economic Analysis in appendix B of the main report.

3.2 Humboldt Harbor

Construction of the existing harbor was completed in 1976 and consists of a north breakwater about 1,500 feet long, a south breakwater 1,000 feet long, a 16-acre mooring basin, and an entrance channel with a depth of -18 feet MLLW. A controlling depth of

-17.3 feet MLLW was recorded near mid-channel of the entrance channel in 1993 (USACE, 1996b).

The facilities consist of 144 slips for vessels up to 65 feet long; 1,400 feet of floating dock for transient boats to side tie; and 750 feet of steel bulkhead. Five dolphins near the north breakwater are used by larger floating processors and commercial barges. A 62-foot by 200-foot dock with a water depth of -30 feet MLLW is located on the seaward side of the south breakwater for loading and off-loading container and cargo ships.

3.3 Physical Environment

3.3.1 Geology.

Sand Point is on the northwest coast of Popof Island in the Shumagin Island Group on the southern coast of the Alaska Peninsula. The Shumagin group is composed of 15 major islands with Popof being one of the largest.

Popof Island, as is much of the nearby Alaska Peninsula, is volcanic in origin. The shoreline of the island is highly irregular and is characterized by steep, rocky cliffs. Rolling terrain is typical of the western side of the island. The eastern side of the island is mountainous with elevations exceeding 1,500 feet.

Popof Island and the Shumagin Island group are different in that they do not possess the jagged mountain peaks and semi-active volcanoes common in the lower Alaska Peninsula. However, the area is one of strong seismic activity. Sand Point is also within an intensive mining claim area containing major and minor amounts of gold, silver, copper, lead, and zinc.

3.3.2 Climate and Weather.

Sand Point's climate is characterized by high winds, mild temperatures, protracted cloud cover, and frequent precipitation. Cyclonic storms frequently move in from the Bering Sea to dominate the region's weather.

The prevailing wind direction is from the northwest at an average annual velocity of about 13 miles per hour (mph). Williwaws (local, very strong, gusty winds) are often experienced during storms and have been estimated to reach velocities of about 70 mph from the southwest and northwest.

The ocean has a moderating effect on the area's climate, lessening distinctions between seasons. July, August and September are known for frequent fog. The first freezing weather generally does not occur until October or November. Both seasonal and diurnal temperature extremes are generally confined to fairly narrow limits. Precipitation falls as snow during winter and as a light drizzle the remainder of the year. Temperatures range from -9° to 76 °F. Snowfall averages 52 inches, and annual precipitation is 33 inches.

3.3.3 Tides and Circulation.

Tides. The west coast of Popof Island, where Sand Point is located, is somewhat protected from storm waves by Unga Island. Storm surges and winds can increase normal high tides by up to 2 feet. At Humboldt Harbor, the extreme tides are 14.5 feet. Spring and neap tidal ranges are 7.3 and 5.3 feet, respectively. The tides in the Sand Point area are diurnal in nature. Table EA-1 presents tidal data for Sand Point.

Table EA-1. Sand Point, Alaska, Tidal Data

Observed Extreme High Water*	11.4 feet MLLW
Mean Higher High Water	7.3 feet MLLW
Mean High Water	6.6 feet MLLW
Mean Tide Level	4.0 feet MLLW
Mean Low Water	1.4 feet MLLW
Mean Lower Low Water	0.0 feet MLLW
Extreme Lower Low Water**	-3.6 feet MLLW

Notes: * December 31, 1986
** February 5, 1985
Source: National Ocean Service, 1994.

Circulation. Circulation in the harbor is dependant on tidal action, which is the dominant mechanism in producing currents and flow. The planform geometry of a harbor has a significant effect on these circulation patterns. Several studies in the Pacific Northwest have been performed to determine boat harbor configuration with optimal circulation and flushing (Cardwell and Koons, 1981; Neece *et al.*, 1979). The studies derived an optimum quantity for the exchange coefficient and harbor aspect ratio. The exchange coefficient measures the relative exchange of water within a harbor basin with ambient water due to tidal flushing of the basin. The coefficient indicates that fraction of water in a basin or segment of the basin that is removed (flushed out) and replaced with ambient water during each tidal cycle. Ideally, for adequate flushing, a gross exchange coefficient should be greater than 0.30. The exchange coefficient can be reliably estimated by the tidal prism ratio when a physical model is not used. The tidal prism ratio is calculated by subtracting the basin volume at MLLW from the basin volume at mean higher high water (MHHW) and then dividing the difference by the basin volume at MHHW.

The harbor aspect ratio is the relationship between the length of the basin and its width. The ratio is calculated by dividing the basin length by its width. The aspect ratio affects the angular momentum, which allows the inflowing ambient water to sweep past a major portion of the basin's interior boundaries without losing its identity by diffusion. Factors contributing to increased angular momentum improve the overall flushing. For adequate flushing, this ratio ideally should be between 0.5 and 2.0.

3.3.4 Sediment Characterization.

Evaluation to determine the need to test material to be dredged is based on guidance in the *Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. - Testing Manual* (U.S. Environmental Protection Agency and USACE, 1994). Sediment samples were collected from the Black Point site in June 1997. Results indicate that the materials proposed for dredging are not contaminated. The method detection limits obtained, for the vast majority of analytes, were well below associated action levels and sediment management criteria. The material to be dredged appears chemically suitable for beneficial use, upland disposal, or open water disposal. Particle size distribution ranged from silty sand to poorly graded sand with gravel. In all but one of the samples, the percent fines (amount of material passing through a No. 200 screen) was less than 5 percent. In the sample taken near the existing south breakwater (sample -01SL), the percent fines was 19 percent. Sampling methods and results are discussed in the Chemical Data Report dated 3 September 1997 in appendix D of the main report (USACE, 1997).

3.3.5 Water Quality.

Overall, water quality within the existing harbor is considered to be fairly good in spite of the recent listing of Popof Strait as a Clean Water Act Section 303 (d) Tier 1 high priority water body (Alaska Department of Environmental Conservation, 1996). Popof Strait's listing is due to seafood residue from the local seafood processing plant exceeding allowable limits.

The community landfill is adjacent to Dome Quarry, approximately 1,000 feet from the proposed project site. The potential exists for leachate from the landfill to affect water quality and sediments at the Black Point site since Black Point is located down gradient. However, based on an analysis of sediments from the Black Point site, this is currently not the case. As discussed in section 3.3.4, contaminants in the vast majority of the sediment samples, were well below associated action levels and sediment management criteria. In addition, the intermittent stream and seepage from the area does not exhibit any visible or aromatic signs of pollution. Closure of the landfill is being investigated by the city.

However, the potential for contaminant migration from the currently active, unlined landfill to the proposed harbor location still exists. A small intermittent stream (<1 cfs flow rate) originates at the landfill and discharges at the Black Point site. If contaminants are transported from the landfill to the harbor site, it could limit future dredging and disposal options and create other concerns. Of particular concern is the harbor layout under alternative 2. This option has the stream discharging in the entrance channel. It is very likely that, if contaminants were transported to the area by the stream, some would become concentrated in harbor sediments, especially since wave energy in the area would be greatly reduced, and the sediments deposited in the harbor would be much smaller, increasing the likelihood for contaminants to accumulate. With alternative 2, it does not appear practical to divert the stream outside of the harbor boundaries. However, with alternative 1, the stream and runoff from the hillside could be easily diverted outside the breakwater, minimizing concerns.

The flushing rate influences a harbor's water quality by affecting such factors as temperature, dissolved oxygen levels, and light penetration. These conditions directly affect local biological communities. Tidal exchange is the principal factor attributed to flushing the harbor and maintaining good water quality. Activities that can result in heavy metal deposits include copper from anti-fouling paints, sacrificial anodes on recreational and commercial vessels and other protectively coated marine hardware, lead from boat batteries, engine exhaust products, and fuel spills. Certain organisms tend to be more tolerant of trace metals than others. Generally, the early life stages of aquatic organisms are the most susceptible to heavy metals and pollutants in general, but many chemical, physical, and seasonal factors influence this toxicity.

3.4 Biological Environment

3.4.1 Vegetation.

Dwarf scrub communities are widespread at higher elevations and in windswept areas, while low scrub communities are common at lower elevations and in more protected areas (U.S. Geological Survey, 1995). Dwarf scrub communities consist of such plants as arctic willow, ericads (e.g., low-bush cranberry, bog blueberry, and alpine bearberry) *Dryas spp.*, mosses, and lichens. Vegetation in low scrub communities include dwarf birch, gray-leaf willow, diamond-leaf willow, Labrador tea, and blue-joint grass.

3.4.2 Birds and Terrestrial Mammals.

Popof Island supports a variety of seabirds, waterfowl, passerines, and raptors. Bald eagles roost at Black Point and occasionally at the city dock. They feed on seafood wastes from the nearby seafood processing plant and on garbage in the landfill. No bald eagles are known to nest in the Black Point area. Sea ducks and other birds use the area for feeding and resting. A number of mapped seabird colonies exist on the northwest side of Popof Island and on Unga Island just to the west of Popof Island (U.S. Fish and Wildlife Service (USFWS), 1978). Species observed in the area include oldsquaws, pigeon guillemots, harlequin ducks, and black-legged kittiwakes. Steller's eiders, white-winged scoters, buffleheads, and mergansers also frequent the area (USFWS, 1997a).

Few terrestrial mammals inhabit the island. The most abundant mammal is the ground squirrel. Other species include bison, small rodents, and hares. No documented resident populations of bear, fox, or caribou exist on the island.

3.4.3 Marine Habitat.

The USFWS conducted detailed site investigations in 1984 and again in 1997 to characterize the biota of the Black Point site. Detailed information on the Black Point site's natural resources can be found in the November 1997 Fish and Wildlife Coordination Act Report (USFWS, 1997a) in appendix 3. Below is a synopsis of the area's marine resources.

Most of the coast line in the Sand Point area is considered to be medium to highly productive. Eelgrass dominates tidal and shallow subtidal areas with a silty/muddy substrate, while areas with a rocky substrates are dominated by brown algae (e.g., *Fucus furcatus, Laminaria bongardiana,* and *L. saccharina*). Algae and eelgrass beds provide the primary production base on which the majority of the local trophic relationships depend. Some of the more mobile components of the ecosystem higher in the food chain are migratory fish, waterfowl and marine mammals. Common invertebrates in the area include starfish, anemones, blue mussels, littorine snails, barnacles, limpets, hermit crabs, sea cucumbers, and polychaete worms.

The offshore waters of the area support a variety of marine fish resources. Dominant fish species encountered in the Shumagin area by weight from the National Maine Fisheries Service (NMFS) 1996 triennial bottom trawl survey were Pacific Ocean cod, arrowtooth flounder, Atka mackeral, walleye pollock, northern rockfish, Pacific cod, Pacific halibut, giant grenadier, flathead sole, northern rock sole, southern rock sole, yellowfin sole, sablefish, shortspine thornyhead, rougheye rockfish, rex sole, light dusky rockfish, harlequin rockfish, starry flounder, and big skate (NMFS, 1996). Humboldt Creek supports runs of coho salmon, pink salmon and Dolly Varden (USFWS, 1997a). Near-shore waters adjacent to Black Point support substantial concentrations of juvenile pink salmon between mid-May and mid-June. Three species of commercially important crab, red king, Tanner, and Dungeness, inhabit the waters near the Shumagin Islands.

Marine mammals inhabiting the waters around Popof Island include sea otters, Steller's sea lions, harbor seals, porpoises, and several species of whale. Sea lion rookeries and hauling grounds exist at the Sealion Rocks (about 15 nautical miles to the south of Humboldt Harbor), at Unga Cape (about 12 nautical miles south), and at the Whaleback and Haystacks in West Nagai Strait (about 15 nautical miles west) (Resource Analysts, 1984).

Based on field observations, aquatic vegetation in Mud Bay is dominated by eelgrass, while vegetation in Popof Cove and Sand Point Spit is dominated by algae. The Black Point site is in a small cove just south of the existing breakwater/city dock. The shoreline is characterized by a sandy beach and rocky outcroppings to the south. The elevation from the shoreline gradually slopes to where deeper water is encountered several hundred feet seaward.

3.4.4 Special Aquatic Sites.

Eelgrass beds, a special aquatic site as defined by 40 CFR Part 230.43, are scatted about the Sand Point area. Eelgrass beds dominate areas with silty/muddy substrates, such as Mud Bay. All alternative sites considered, including the Black Point site, contain eelgrass. Eelgrass at Black Point is more prevalent near the existing south breakwater, while algae dominates the area near Black Point itself.

3.4.5 Endangered, Threatened, and Candidate Species.

The Alaska District coordinated with the USFWS and the NMFS to determine if any threatened, endangered, or candidate species inhabit the area. The project is within the historic range of the Steller's sea lion (endangered) and spectacled eider (threatened). The biological assessment to identify impacts on these species, as required by Section 7(c) of the Endangered Species Act, is included in this section and in the Endangered, Threatened, and Candidate Species section in the Environmental Consequences and Mitigation Measures section of this report.

Spectacled eiders were designated as a threatened species on May 10, 1993, primarily due to their rapid and continuing decline on the Yukon-Kuskokwim Delta breeding grounds. Factors known to have contributed to their decline include lead poisoning, predation, and human harvest. In Alaska, nesting primarily occurs on the Yukon-Kuskokwim Delta and the North Slope. Known wintering grounds in Alaska waters include Norton Sound, Ledyard Bay, Peard Bay, and near St. Lawrence Island. All of these known wintering areas are more than 500 miles north of Sand Point.

The Steller's sea lion (northern) was placed on the endangered species list in April 1997 due to recent declines in populations in the western Gulf of Alaska. Current populations in the area from Prince William Sound to the Aleutian Islands are estimated to be around 44,300. Recent declines are believed to be primarily the result of juvenile mortality. The northern sea lion is distinctive in its use of a few specific locations along the coast as breeding and pupping rookeries and hauling-out grounds. The nearest mapped rookery and haul-out ground to Sand Point is at Unga Cape, about 12 nautical miles to the south.

3.5 Cultural Resources

The lower Alaska Peninsula and the islands in the vicinity have not been completely inventoried for cultural resources. However, one could expect to find archeological sites in the area dating back to some of the earliest known on the Alaska Peninsula and Aleutian Islands. One of the earliest known prehistoric sites is on Anangula Island, near Nikolski Village. This site dates to 8,500 years ago, and its assemblage is characterized by prismatic cores, unifacial blades, and burins (Laughlin, 1980).

There was a gradual shift in the area from unifacial to bifacial flaking. Sites representing this change in technology include Sandy Beach, on Umnak Island (4,000 to 5,000 years ago); Chaluka midden, at Nikolski (4,000 to present); and Hot Springs, at Port Moller (3,500 to 1,500 years ago). The Hot Springs site, one of the oldest known cultural resources on the lower Alaska Peninsula, consists of a large midden and about 250 depressions thought to be house pits. Artifacts typical of the assemblage include bifacially chipped stone tools and bone harpoon-dart heads, projectiles, fish spears and awls (Dumond, 1977; Laughlin, 1980; McCartney, 1979).

The Paleo-Eskimo Norton tradition spread south to the Alaska Peninsula between 3,000 and 1,500 years ago. Technological traits adopted by the inhabitants included polished slate tools and pottery. Assemblages of the lower Alaska Peninsula and eastern Aleutians of the past 1,000 years usually consist of middens comprised of shells, sea urchins, fish and bird bones and lithic waste flakes. Typical artifacts are bifacially flaked tools and bone implements, with ground slate increasing in popularity through time (Dumond 1977; McCartney 1972).

At the time of European contact (1741), the Shumagin Islands were populated by the easternmost group of Aleuts. They lived in large semi-subterranean sod houses called barabaras by the Russians and hunted sea otters and sea mammals with harpoons, spears, and clubs from two-hatched kayaks (baidarkas). Intertidal and onshore collecting of berries, grass, eggs, shellfish, sea urchins, octopus, algae, and seaweed contributed to the dietary intake. At death, people were either buried in a flexed position or mummified. Mummies in the Shumagin Islands were reported in the 19th century by Pinart, but the location is unknown. Midden deposits, unifacial and bifacial artifacts, bone sea mammal hunting artifacts, barabaras, and mummified remains are a sample of the type of cultural remains that may eventually be found in the vicinity of Sand Point (Laughlin, 1980; McCartney, 1972).

Under Russian domination, fur hunters, traders, and trappers (promyshlenniks) expanded eastward from the Aleutians to the Alaska Peninsula, Kodiak, and Southeast Alaska. Russian missionaries established churches and schools and a trading post setup by the Russian-American Company. Administratively, the Sand Point vicinity was under the control of the Unalaska district with a local headquarters on Unga Island. After the sale of Alaska to the United States in 1867, the Aleutians continued to be of great economic importance, with Unalaska functioning as a major port. Fur production, fishing, and mining were important on the lower Alaska Peninsula and throughout the chain. The first attempt at fox farming began in 1880 at Sand Point. Six miles northeast of Sand Point, the first American cod salting station was built in 1876. A minor gold strike occurred at Popof Island in 1904. On Unga Island, a large gold strike was made at Unga in 1886. The Apollo mine operated sporadically until the 1930's. Coal was mined 10 miles west of the project area on the east side of Unga Island. The settlement, Coal Harbor, had a post office that was abandoned around 1915 (Alaska Geographic, 1980; Laughlin, 1980; McCartney 1972, 1979; Orth, 1967). Sand Point was settled toward the end of the last century, receiving a post office in 1891.

Shoreward portions of the area of potential effect at the Black Point site were archaeologically surveyed in 1984. No sites were identified (see June 23, 1997 letter from the State Historic Preservation Officer in appendix 2). The nearest known cultural resource to the Black Point site is the St. Nicholas Chapel, a Russian Orthodox church, which was built in 1933 and is now on the National Register of Historic Places.

3.6 Subsistence Activities

Subsistence harvesting of fish and wildlife is important to area residents. Salmon and caribou are the primary species harvested. Caribou are hunted on the Alaska Peninsula, since resident populations do not occur on Popof Island. Residents also harvest waterfowl in areas such as Left Hand Bay on Unga Island and as far away as Izembek and Nelson Lagoons. Other resources harvested by local residents include bison, crab, bird eggs, shellfish, and berries (Resource Analysts, 1984). Bison are not native to the area, but were introduced to the island.

3.7 Coastal Zone Management

Sand Point is within the Aleutians East Borough Coastal Management Program (CMP) boundaries. Federal approval for the Aleutians East Coastal Resource Service Area (CRSA) CMP was obtained in April 1986. In November 1992, the Aleutians East Borough revised the Aleutians East CRSA CMP to reflect its status as a borough, to address areas included in the borough formation not previously included in the CRSA, and to revise the enforceable policies and definitions.

The proposed action is water dependent and is not within a mapped geophysical hazard or recreation area. The harbor has been sited to minimize the duplication of facilities, improve harbor use efficiencies, and minimize potential adverse environmental effects. Design and construction of the facility would include measures to mitigate potential adverse effects on fishery resources and marine habitats. To the extent practicable, the proposed navigation improvements comply with Coastal Area Boundary policies, including those regarding fish and wildlife, air and water quality, coastal development, subsistence, and cultural resources.

4. ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

4.1 No-Action Alternative

With the no-action alternative, the project purpose and need would not be fulfilled. Both beneficial and adverse effects from construction and use of the harbor would not occur. Overcrowded conditions would continue to cause shortages of mooring space and damage to vessels and inner harbor facilities. Vessels seeking safe refuge would have to use other ports or weather-out storms. The community would not experience beneficial socio-economic effects from the development, such as increased employment opportunities during construction. However, adverse environmental effects associated with construction and use of the proposed harbor would not occur.

4.2 Alternative Sites Considered

Environmental effects from construction and use of a harbor at either the Mud Bay, Popof Cove, Black Point, or Sand Point Spit sites would be somewhat similar. Construction would entail the dredging of materials to obtain the design depth, the disposal of the dredged material, and the construction of a rubblemound breakwater. However, there would be individual site differences as discussed below. Detailed analysis of the environmental consequences and mitigation measures are discussed in relation to the preferred site, Black Point.

4.2.1 Mud Bay.

Mud Bay, a shallow-water cove at the north end of the community, supports extensive amounts of eelgrass, more than any other site considered. Construction of a harbor at this location would be expected to permanently eliminate the site's eelgrass beds. Due to the site's relatively shallow depth, approximately -6 feet MLLW, extensive dredging would be required (about 400,000 yd^3). Because of the vast amount of material to be dredged, an inland-water disposal site would more than likely be needed for its disposal, resulting in additional environmental effects.

Use of this site would cause socio-economic effects. The uplands surrounding the cove are zoned for residential use. Also, the immediate area has no industrial or commercial infrastructure. The surrounding land would have to be re-zoned and the necessary infrastructure would have to be constructed. Since less damaging practicable alternative sites exist, Mud Cove was eliminated from further consideration.

4.2.2 Popof Cove.

Shallow subtidal and tidal areas of Popof Cove are primarily vegetated with algae, along with some eelgrass. Productivity of the marine biota appears similar to that of Black Point. As with the Mud Bay site, the area is zoned residential and lacks commercial and industrial infrastructure. There are also numerous residences along its shoreline. Furthermore, use of this area for commercial/industrial activities is strongly opposed by the local community. For these reasons, the site was eliminated from further consideration.

4.2.3 Sand Point Spit.

Of the sites considered, Sand Point Spit appeared to have the lowest density of algae and eelgrass. However, because of the deep water just off shore, development of the site for the design fleet would require extensive breakwater construction with large quantities of materials. Real estate issues involving Peter Pan Seafoods, the predominant upland land owner, are also a major consideration; consequently, use of this site did not appear favorable during initial investigation. For these reasons, the Sand Point Spit site is not considered practicable.

4.3 Black Point Harbor Expansion (Proposed Action)

Environmental effects associated with a harbor project at the Black Point site are discussed below. Unless otherwise noted, the environmental effects would be similar for either of the two alternative designs. Alternative 1 was chosen over alternative 2 as the preferred alternative because (1) concerns over the transport of contaminants from the landfill are reduced; (2) the size of the harbor is about 2.7 acres smaller; however, it still would accommodate the same number of vessels (37); and (3) the design has a better cost to benefit ratio, making it the preferred NED alternative.

4.3.1 Currents.

Construction of the proposed harbor is expected to cause minor changes in current patterns in the immediate project area. Changes are not expected to cause appreciable accretion or erosion problems. The transport of sediments in the area is minimal, as indicated by a lack of accretion of sediments within the existing harbor and entrance channel. Maintenance dredging of the proposed harbor would be expected to be minimal, as discussed above in section 2.3.3.

Flushing and circulation patterns are expected to be good for both alternatives. A clockwise gyre driven by tidal currents would flush the harbor through the new entrance channel. The aspect ratio for alternative 1 is 1.98 and the aspect ratio for alternative 2 is 1.72, both within the ideal range of 0.5 and 2.0. The tidal prism ratio for both alternatives is 0.26, which is slightly below the preferred value of 0.30. These values can be compared to the existing harbor, which has an aspect ratio of 1.8 and a tidal prism ratio of 0.27.

4.3.2 Water Quality.

Dredging the harbor and the associated discharges would temporarily increase water turbidity at the project site. Tidal current and action would cause any loosened fine-grained material to form a sediment plume. Breakwaters would be constructed prior to dredging to help contain the sediment plume associated with dredging activities. Considering the minimal amount of fines in the material to be dredged, as discussed in section 3.3.4, plumes are expected to be localized and short-lived. Suspended sediments would be expected to temporarily decrease light penetration, primary productivity, and dissolved oxygen levels. Sediment constituents would be released into the water column, where they are more readily available to organisms. Mixing and dilution in the overlying water would be expected to decrease turbidity levels. As recommended by the USFWS, silt curtain(s) would be used to contain sediment plumes between April 15 and June15, minimizing potential adverse affects on fishery resources.

Harbor operation and harbor-related activities historically degrade water quality. Incidental discharges of pollutants such as paints, fuel, oil, human refuse, fish wastes, and discarded debris contribute to poor water quality. The city of Sand Point would be responsible for providing such facilities as trash receptacles and used oil disposal containers. Harbors with good circulation and flushing characteristics quickly disperse pollutants and prevent them from accumulating. As discussed above in section 4.3.1, circulation is expected to be good, thus, minimizing water quality concerns.

Concerns have been expressed regarding construction of a new road between Dome Quarry and the project site creating erosion problems and adversely affecting fish and wildlife resources. A trail, which has been used by heavy equipment, already traverses down the hill from the quarry to the existing harbor. If this trail was used or a new road constructed, it would be addressed in the contractor's quarry plan. If constructed and maintained properly, a road from the quarry to the project site would not be expected to create erosion problems.

4.3.3 Avian and Marine Biota.

Dredging the harbor, construction of the breakwaters, and disposal of dredged materials would have direct impacts on 18.3 to 21 acres of habitat, including about 1,000 linear feet of shoreline. Organisms inhabiting the project area would be displaced or destroyed. The majority of the dredged materials would be used to create a needed storage/access area along the shoreline of the new basin. A portion of the dredged material would also be used to complete a previously started project at the existing harbor. Environmental effects from disposal at the existing harbor were considered during the required State and Federal permitting process (see section 2.3.1 above). Any remaining material would be discharged in the northwest corner of the new basin in water in excess of –20 feet MLLW. This discharge is expected to have beneficial effects on water quality and circulation by reducing the likelihood for the accumulation of debris and harbor related wastes.

Blasting rock (approximately 5,400 yd^3) is expected to be necessary. Alaska Department of Fish and Game (ADF&G) standard blasting stipulations, as listed below, would be incorporated into the development of a blasting plan.

a. Blasting shall be scheduled at a time when few fish, birds, or marine mammals are in the vicinity.

b. Prior to each blast, the area shall be patrolled by boat or on the shore, and devices/techniques authorized by the USFWS and the NMFS shall be used to move birds and marine mammals away from the project area.

c. For blasting, employing either dobying or drill-and-blast technique, the size of individual explosive charges shall be minimized to reduce resultant hydrostatic pressure waves. Maximum allowable shock-wave impulse strengths at specified distances from the blast site shall be employed. An upper limit of 0.69 bar per millisecond (*i.e.*, 10 psi/millisecond) as measured at the mid-water column depth, 100 meters from the charge shall be employed. Each blast shall be closely monitored, the hydrostatic pressures measured and recorded, and the charges adjusted as necessary to ensure that "allowable" hydrostatic over-pressures are not exceeded.

d. After each detonation, a visual survey shall be made of the project site within 400 meters of the blast and all dead fish and wildlife removed from the water to prevent attracting foraging fish and wildlife to the area. Animal carcasses shall be disposed of at an upland location and in accordance with any State or Federal requirements.

The blasting plan would be coordinated with ADF&G, USFWS, and NMFS. In addition to complying with these stipulations, an air curtain would be employed to reduce shockwave impulses, and Corps employee(s) would be on-site to assist in the monitoring effort.

Air curtains have been used with mixed results in several Corps of Engineer projects nationwide (USACE, 1996c). Where air curtains did not perform to expectations, there was always a physical problem associated with the continuity, location, or volume of the air curtain. Properly employed air curtains have had excellent results. Air curtains must cover the entire water column and must completely surround the blast to be effective. The air curtain must form a semi-circle around the blast site with the air curtain reaching from the water/shore interface on both sides of the semicircle. If not, shock waves will bounce off hard surfaces and pass around and beneath the air curtain.

Other failures occurred with insufficient air pressure to make adequate bubbles. Studies indicate that 100 pounds per square inch in the manifold is required to deploy sufficient air to successfully diminish the shock waves. Successful manifolds consist of PVC pipe of 3/4-inch inside diameter with 1 millimeter holes drilled at 1/2-inch intervals.

Air curtains appear to attract marine mammals, making them more vulnerable to the blast. Several steps have been incorporated into the process to lessen the potential impact on marine mammals. Prior to any blast, the area would be observed for the presence of marine mammals. When the observer was relatively sure no animals were within the proximity of the blast, the air curtain would be deployed. When the air curtain was fully developed, the explosives would be detonated. After the blast and the subsidence of the shock waves, the air curtain would be turned off. The entire process from deploying the air curtain to completion should take no more than a minute or two.

After construction was completed, marine organisms would be expected to colonize the basin and the perimeter of the breakwater within a few growing seasons. Species composition and density would not mirror pre-construction conditions since the water depth and substrate composition would be altered. The net production of biomass at the site is expected to be greatly reduced as compared with pre-project conditions. However, the loss would be expected to have negligible to minimal individual and cumulative effects on the environment of the Sand Point area. There are thousands of miles of similar undeveloped shoreline on the Alaska Peninsula. Popof Island, on which Sand Point is located, has over 35 miles of coastline, and about 8 miles of coastline, most of which are undeveloped, are within the Sand Point city limits.

The USFWS listed pink salmon, sea otter, and harlequin duck as their mitigation evaluation species in their Fish and Wildlife Coordination Act Report. Harbor construction would not have a direct affect on any freshwater salmon rearing or spawning areas due to the site's distance from such habitats. Bird species less tolerant of human activity would likely be permanently displaced by construction of the harbor improvements. Whereas, species more tolerant to human activity, such as gulls, would not be expected to be adversely affected.

The USFWS is studying harlequin ducks to assess population trends (USFWS, 1997a). Harlequin ducks breed on rocky coastal islets, forested mountain streams, and occasionally on open tundra. They feed on crustaceans, mollusks, aquatic insects, and at times, fish (Ehrlich, *et. al*, 1988). Harlequin ducks are common throughout southwest, southcentral, and southeast Alaska (Armstrong, 1986), and have been observed in the Sand Point area (USFWS, 1997a). The Black Point site is not known to be a critical nesting, feeding, or rearing area for harlequin ducks or any other species of bird.

Sea otters are common throughout southcentral and southwest Alaska. Sea otter populations in Alaska are estimated at a minimum of 100,000, and are expected to continue to grow (USFWS, 1997b). Sea-otters have been known to feed on mollusks and other invertebrates at the Black Point site, as is evidenced by otter-predated clam shells found there. Local residents have rarely seen otters at the Black Point site in recent years. However, otters are commonly seen north of the project area near Popof Cove and Mud Bay. It is not known why otters are not using the Black Point site. Otters would be expected to continue to avoid the area and to use more suitable habitats during and after construction. The Black Point site is not known to be a critical habitat for sustaining sea otter populations.

4.3.4 Threatened and Endangered Species.

The nearest Steller's sea lion haul-out and rookery area to Sand Point is approximately 12 nautical miles. Steller's sea lions have been sighted in the project area; however, this area is not known to be a critical or regularly used feeding area. Spectacled eiders are not known to nest in the project area. If spectacled eiders use the area, it is incidental. The proposed action would not be expected to adversely affect Steller's sea lions, spectacled eiders, or any other threatened or endangered species or their critical habitat. This determination has been coordinated with the USFWS and NMFS.

4.3.5 Special Aquatic Sites.

Eelgrass beds within the project footprint would be eliminated and would not be expected to become re-established. The environmental values these vegetated shallows provide such as nursery, cover, and forage areas would be eliminated. However, this loss of habitat would not be expected to have more than a negligible affect on the aquatic resources of the Alaska Peninsula area due to the relatively small footprint of the project and the vast amount of undeveloped coastline in the area. Impacts to eelgrass beds have been avoided to the extent practicable. Potential sites, such as Mud Bay, with greater densities of eelgrass, have been avoided. Since impacts cannot be completely avoided (*i.e.* no practicable alternative), and all practicable measures to minimize harm to the habitat would be incorporated into the project, the proposed discharges comply with the

Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material (see appendix 1).

4.3.6 Cultural Resources.

Coordination with the State Historic Preservation Officer (see appendix 2) determined that no resources listed on or eligible for inclusion in the National Register of Historic Places are known to exist in the project vicinity.

4.3.7 Subsistence Activities.

No appreciable adverse effect is expected to occur to subsistence activities or resources. Construction of the harbor would be coordinated with the city of Sand Point and the Aleutian East Borough to avoid conflicts with subsistence activities.

4.3.8 Noise and Air Quality.

There would be minor increases in noise levels and air emissions from the operation of heavy equipment during periods of work and with the continued use of the harbor. Wildlife sensitive to increased noise levels would be expected to avoid the project site. No appreciable effect to the human environment is expected to occur since the project is located in an industrial/commercial area of town, far removed from area residences. Sand Point is not within a non-attainment area for air quality.

4.3.9 Socio-economic Impacts.

The proposed project would provide approximately 37 additional moorage spaces. Overcrowding at the existing harbor would be greatly reduced, thus minimizing vessel damage, personal injuries, risk of fire, and operational inefficiencies. The proposed harbor facilities would contribute to the future growth of Sand Point, providing increased employment opportunities during construction and by accommodating a larger fleet. Siting of the harbor at Black Point would be consistent with local zoning and would minimize potential conflicts between residential and commercial development.

Local residents use the sandy beach at the Black Point site for recreational activities. Construction of a harbor there would eliminate this beach area. Those who currently use it would have to find other beaches for recreation, such as the one across Popof Strait on Unga Island.

On 11 February 1994, Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations* was issued. The purpose of the order is to avoid the disproportionate placement of Federal actions and policies having adverse environmental, economic, social, or health effects on minority and low-income populations. Based upon an analysis of 1990 U.S. Census data, the make-up of the minority and low-income population of Sand Point is similar to the Aleutian East Borough's as a whole. Other communities in the borough, such as Nelson Lagoon and False Pass, have a much higher Native population and a greater percentage of the population below the poverty level. Likewise, there are communities in the Aleutians East Borough that have a much higher non-Native population and a greater percentage of the population above the poverty level. Table EA-2 provides demographic and economic information on communities in the Aleutians East Borough. Detailed information on area economics, demographics, and sociological issues is contained in the Economic Analysis in appendix B of the main report.

Table EA-2. Demographic and Economic Data

Community	Total Population	Percent Native	Median Household Income	Percent Below Poverty
Aleutians East Borough	2,464	42.3	$42,384	11.8
Akutan	589	13.6	$27,813	16.6
Cold Bay	148	5.4	$45,625	0
False Pass	68	76.5	$21,667	17.9
King Cove	451	39.2	$53,631	10.0
Nelson Lagoon	83	80.7	$44,583	26.0
Sand Point	878	49.3	$42,083	12.5
Based upon 1990 U.S. Census data (Alaska Department of Community & Regional Affairs Community Database, 1996).				

Construction of the proposed harbor would have both beneficial and detrimental effects on the entire population of Sand Point, not just one demographic or economic group. The harbor would not be sited in a low income or minority area of town. It would be in an industrial area, far removed from residences. Contrary to resulting in a disproportionate placement of adverse environmental, economic, social, or health effects on minority and low-income populations, the proposed action would result in economic and social benefits to the local community as a whole.

On 21 April 1997, Executive Order 13045, *Protection of Children From Environmental Health Risks and Safety Risks* was issued to identify and assess environmental health and safety risks that may disproportionately affect children. The proposed action would affect the community as a whole. There would be no environmental health or safety risks associated with the action that would disproportionately affect children.

4.3.10 Mitigation Measures Considered.

The project, as proposed, contains all appropriate and practicable mitigation measures to minimize potential adverse environmental effects. Siting the harbor at Black Point avoids higher value sites such as Mud Bay. No less damaging practicable alternative sites exist that would accomplish the project purpose and need. Mitigation measures to minimize potential adverse impacts include:

- Designing the harbor to maximize the number of vessels that it could safely accommodate, while minimizing the project footprint.

- Using a silt curtain for in-water work between April 15 and June 15 to reduce potential adverse impacts from sediment plumes.

- Constructing the breakwater prior to dredging the basin to help contain potential sediment plumes from dredging activities.

- Coordinating construction of the harbor with the city of Sand Point and the Aleutian East Borough to avoid conflicts with subsistence activities.

- Developing a quarry development plan that would include limits on construction, disposal of quarry waste, necessary access and traffic routes, quarry rock stockpile area(s) and other stockpile areas for material to be used for quarry restoration. The plan would also include measures to control erosion and minimize adverse impacts from storm water runoff. A coordinated agency review of the plan would be conducted, thus providing the opportunity for State and Federal agencies to place stipulations on the use of the quarry site.

- Compliance with ADF&G standard blasting stipulations and coordination of a blasting plan, to include the use of an air curtain, with ADF&G, USFWS, and NMFS.

The mitigation proposed by the Alaska District would minimize the loss of in-kind habitat to the extent appropriate and practicable. However, the project would result in the loss of marine habitat and a reduction in the site's net productivity, and thus contribute to the cumulative loss of aquatic habitat in the area. As a result, the need for compensatory mitigation was considered. No appropriate on-site and in-kind compensatory mitigation measures could be identified. Trying to replace lost eelgrass beds and benthic habitat on site would be logistically difficult and would not likely to be successful.

Post-construction follow-up studies are also not considered practicable or warranted for this project. Such studies would not benefit the resources at the project site. In addition, the project does not contain controversial or questionable design features that would benefit from a study. Dive surveys were conducted within the existing harbor in 1984, approximately 8 years after the harbor was constructed, documenting reductions in lower composite infaunal biomass as compared to the undisturbed substrate at Black Point (USFWS, 1985).

Off-site and particularly out-of-kind mitigation measures, such as fox control on an Aleutian Island, are also not warranted considering the anticipated impacts as discussed in this document. Most of the coast line in the Sand Point area is of similar value (*i.e.*, the project site is not unique). Development in the Alaska Peninsula/Sand Point area is minimal and is not expected to increase dramatically in the near future. The project site is not known to be critical or essential for maintaining fish and wildlife resource populations. And, the losses would not have an appreciable adverse affect on area resources. It is therefore, not considered appropriate or warranted to increase project costs, which would be born by the local sponsor, for off-site and out-of-kind compensatory mitigation measures. The anticipated impacts, and net affects of the habitat loss for this particular project do not warrant such mitigation measures.

4.3.11 Required Permits and Authorizations

Construction of the preferred alternative would require the following permits and authorizations:

- Certificate of Reasonable Assurance (Section 401 of the Clean Water Act Water Quality Certification) from the Alaska Department of Environmental Conservation.

- Conclusive Coastal Zone Consistency Determination from the Alaska Division of Governmental Coordination.

5. CONCLUSION

Development of alternative 1 at the Black Point site in Sand Point, Alaska, as discussed in this document, would not cause significant impacts to the environment. The proposed action is consistent with the State of Alaska and Aleutians East Coastal Management Programs to the maximum extent practicable. This assessment supports the conclusion that the proposed project does not constitute a major Federal action significantly affecting the quality of the human environment; therefore, a finding of no significant impact will be prepared.

6. AGENCIES AND PERSONS CONTACTED

Richard Albright, Alaska Operations Office, Environmental Protection Agency
Judith Bittner, Department of Natural Resources, State Historic Preservation Officer
Wayne Dolezal, Alaska Department of Fish and Game
Matthew Eagleton, National Marine Fisheries Service
Laurie Fairchild, U.S. Fish and Wildlife Service
Robert Galovin, City of Sand Point
Raymond E. Nutt, Shumagin Corporation
George Gunderson, Sanak Corporation
Robert S. Juettner, Aleutians East Borough
Maureen McCrea, Office of Management and Budget, Division of Governmental Coordination
Jim Miller, Trident Seafoods
Peggy Osterback, Qagan Tayagungin Tribe
Alice Petrivelli, Aleut Corporation
Gary Prokosch, Alaska Department of Natural Resources, Division of Water
Tim Rumfelt, Alaska Department of Environmental Conservation
Dale Shwarzmiller, Peter Pan Seafoods
David Soulak, City of Sand Point

Richard Thompson, Alaska Department of Natural Resources, Division of Land
Gary Wheeler, U.S. Fish and Wildlife Service

7. PREPARER OF THIS DOCUMENT

This environmental assessment was prepared by Mr. William D. Abadie, biolgist, of the Environmental Resources Section, Alaska District, Corps of Engineers. Mr. Guy McConnell, biologist, Mr. John Burns, fisheries biologist, Ms. Georgeanne Reynolds, archeologist, and Ms. Diane Walters, writer-editor, contributed to the content and editing of the document. The study manager is Ms. Janis Kara, Economics Section, Alaska District, Corps of Engineers.

8. REFERENCES

Alaska Department of Community & Regional Affairs Database. 1996. Alaska's Cities, Towns and Villages.

Alaska Department of Environmental Conservation, Division of Air and Water Quality. 1996. *Alaska's 1996 Water Quality Assessment Report, Clean Water Act, Section 305(d) and Section 303(d) Submittal to the U.S. Environmental Protection Agency.*

Alaska Geographic. 1980. *The Aleutians,* Vol. 7 (3).

Armstrong, Robert H. 1986. *A New, Expanded Guide to the Birds of Alaska,* Anchorage: Alaska Northwest Publishing Company.

Cardwell, R.D., and Koons, R.R. 1981. *Biological Considerations for the Siting and Design of Marinas and Affiliated Structures in Puget Sound,* State of Washington, Department of Fisheries, Technical Report No. 60.

The City of Sand Point. *A Fishery Development Opportunity in Sand Point, Alaska* brochure.

Dumond, D.E. 1977. *The Eskimos and Aleuts,* Thames and Hudson, London.

Ehrlich, Paul R., David S. Dobkin, and Darryl Wheye. 1988. *The Birder's Handbook, A Field Guide to the Natural History of North American Birds*, Simon and Schuster, Inc., New York.

Laughlin, W.S. 1980. *Aleuts: Survivors of the Bering Land Bridge,* Holt, Rinehart and Winston, New York.

McCartney, A.P. 1972. *An Archeological Site Survey and Inventory for the Aleutian Islands National Wildlife Refuge,* Ms. submitted to the Wilderness Studies Branch, U.S. Fish and Wildlife Service, Anchorage, Alaska.

USFWS. 1985. *Sand Point Small Boat Harbor, Sand Point, Alaska, Feasibility Stage, Draft Fish and Wildlife Coordination Act Report.*

USFWS. 1997a. *Sand Point Harbor Expansion Project, Sand Point, Alaska, Fish and Wildlife Coordination Act Report.*

USFWS. 1997b. Marine Mammal Management Sea Otter Program information on the internet at http://www.r7.fws.gov/mmm/.

McCartney, A.P. 1979. *Working Draft E.I.S. for World War II Debris Removal and Cleanup, Aleutian Islands and Lower Alaska Peninsula, Alaska, (Appendix J: Archeology and History),* Submitted by Tetra Tech to U.S. Army Corps of Engineers, Alaska District under contract #DACW85-78-C-0022.

Neece, R.E., E.P. Richey, J. Rhee and H.N. Smith. 1979. *Effects of Planform Geometry on Tidal Flushing and Mixing in Marinas,* University of Washington, Department of Civil Engineering, Technical Report No. 62.

NMFS. 1997. *Report to Industry: Fishing Log for the 1996 Bottom Trawl Survey of the Gulf of Alaska,* prepared by James Stark, Alaska Fisheries Science Center Processed Report 97-5.

National Ocean Service. 1994. *Monthly Extreme Tides from 1972-1992,* National Oceanic and Atmospheric Administration.

Orth, D.J. 1967. *Dictionary of Alaska Place Names,* (Geological Survey Professional paper #567),Washington, D.C., U.S. Government Printing Office

Resource Analysts. 1984. Resource Inventory for the Aleutians East Coastal Resource Service Area.

USACE, Alaska District. 1986. *Draft Detailed Project Report, Sand Point, Alaska, Small Boat Harbor.*

USACE, Alaska District. 1995. *Reconnaissance Report for Boat harbor Improvements, Sand Point, Alaska.*

USACE, Alaska District. 1996a. *Reconnaissance Report for Boat Harbor Improvements, Sand Point, Alaska, Supplement.*

USACE, Alaska District. 1996b. *1996 Project Maps & Index Sheets. Rivers and Harbors Flood Control.*

USACE, Alaska District. 1996c. *Kodiak Harbor Project Modification, Kodiak, Alaska.*

USACE, Alaska District. 1997. *Chemical Data Report, Pre-Dredge Sediment Sampling, Humboldt Harbor Expansion, Sand Point, Alaska.*

U.S. Environmental Protection Agency and USACE. June 1994. *Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S.* - Testing Manual (Draft).

U.S. Geological Survey, EROS Data Center, Alaska Field Office. 1995. *Alaska Ecoregions, 11, Alaska Peninsula Mountains.*

USFWS. October 1978. *Catalog of Alaskan Seabird Colonies.*

APPENDIX 1

SECTION 404(b)(1) GUIDELINES EVALUATION

Section 404(b)(1) Guidelines for the Specification
of Disposal Sites for Dredged or Fill Material
40 CFR Part 230

SUBPART A - GENERAL

Dredged or fill material should not be discharged into the aquatic ecosystem unless it can be demonstrated that such a discharge will not have an unacceptable adverse impact, either individually or in combination with known and/or probable impacts of other activities affecting the ecosystems of concern.

The Guidelines were developed by the Administrator for the Environmental Protection Agency (EPA) in conjunction with the Secretary of the Army acting through the Chief of Engineers under Section 404(b)(1) of the Clean Water Act (33 U.S.C. 1344). The Guidelines are applicable to the specification of disposal sites for discharges of dredged or fill material into waters of the United States (U.S.).

In evaluating whether a particular discharge site may be specified, the following steps should generally be followed: (a) review the restriction on discharge, the measures to minimize adverse impacts, and the required factual determinations; (b) examine practicable alternatives to the proposed discharge; (c) delineate the candidate disposal site; (d) evaluate the various physical and chemical components; (e) identify and evaluate any special or critical characteristics of the candidate disposal site and surrounding areas; (f) review factual determinations to determine whether the information is sufficient to provide the required documentation or to perform pre-testing evaluation; (g) evaluate the material to be discharged to determine the possibility of chemical contamination or physical incompatibility; (h) conduct the appropriate tests if there is a reasonable probability of chemical contamination; (i) identify appropriate and practicable changes in the project plan to minimize the impact; and (j) make and document factual determinations and findings of compliance.

SUBPART B - COMPLIANCE WITH THE GUIDELINES

The proposed navigation improvements at Sand Point (alternative 1 at the Black Point site) would involve discharges of fill material into special aquatic sites and other waters of the U.S. to provide additional moorage space. A description of the proposed action and alternatives considered can be found in section 2 of the attached environmental assessment (EA). There are no practicable alternatives to the proposed discharge (preferred alternative) that would accomplish the project's purpose and need and not result in a discharge into a water of the U.S. or have a less adverse impact on the aquatic ecosystem. Therefore, the proposed action is considered the least damaging practicable alternative.

As determined in Subparts C through G of this evaluation and as discussed in the EA, the proposed project would not contribute to significant degradation of the waters of the U.S., including adverse effects on human health or welfare, life stages of aquatic life and other wildlife dependent on aquatic ecosystems, aquatic ecosystem diversity, productivity and stability, and recreational, aesthetic, and economic values. In addition, the discharge of fill materials associated with the proposed action complies with the requirements of the guidelines with the inclusion of appropriate and practicable discharge conditions (see Subpart H below) to minimize pollution and adverse effects to the affected aquatic ecosystems.

SUBPART C - POTENTIAL IMPACTS ON PHYSICAL AND CHEMICAL CHARACTERISTICS OF THE AQUATIC ECOSYSTEM

Applicable information about direct, indirect and cumulative environmental impacts of the proposed action and alternatives related to substrate, suspended particulates/turbidity, water, current patterns and water circulation, and normal water fluctuations is contained in sections 3.3, 4.3.1, 4.3.2 and 4.3.3 of the EA. Adverse impacts to these characteristics are expected to be relatively minor. Work would result in minor increases in turbidity levels during periods of work, and minor changes to existing current patterns in the immediate project area. No appreciable adverse effects are anticipated to occur.

SUBPART D - POTENTIAL IMPACTS ON BIOLOGICAL CHARACTERISTICS OF THE AQUATIC ECOSYSTEM

Pertinent information about direct, indirect, and cumulative impacts of the proposed action and alternatives related to threatened and endangered species, fish, aquatic organisms, and other wildlife is contained in sections 3.4, 4.3.3, 4.3.4, and 4.3.5 of the EA. Adverse impacts resulting from the discharge of dredged and/or fill materials are expected to relatively minor. Work would result in direct impacts to 18.3 acres of marine habitat, and a reduction in the net productivity of the site. Effects to threatened and endangered species would not occur.

SUBPART E - POTENTIAL IMPACTS ON SPECIAL AQUATIC SITES

The proposed action would adversely affect eelgrass beds, a special aquatic site as defined by 40 CFR 230.43. Discussions about impacts on functions and values associated with the proposed work are found in sections 3.4.4, and 4.3.5 of the EA. Eelgrass beds within the project footprint would be eliminated and would not be expected to become re-established.

SUBPART F - POTENTIAL EFFECTS ON HUMAN USE CHARACTERISTICS

Human use characteristics affected by the proposed project include fisheries, aesthetics, and recreation areas. Pertinent information about potential impacts of the proposed work on human use characteristics can be found in sections 3.1, 3.6, 4.3.7, and 4.3.9 of the EA. The proposed harbor facilities would contribute to the future growth of Sand Point by providing increased employment opportunities during construction and by accommodating a larger fleet, while having minimal adverse affects on human use characteristics.

SUBPART G - EVALUATION AND TESTING

The potential for encountering hazardous wastes is discussed in section 3.3.4 of the EA and appendix D of the main report. Sediment sample results indicate that the sediment proposed for dredging is not contaminated and is suitable for beneficial use, upland disposal, or open-water disposal.

SUBPART H - ACTIONS TO MINIMIZE ADVERSE EFFECTS

The project, as proposed, contains all appropriate and practicable mitigation measures to minimize adverse environmental effects. Actions proposed to minimize potential adverse effects for the proposed project are listed below and discussed in section 4.3 of the EA.

- Designing the harbor to maximize the number of vessels that it can safely accommodate, while minimizing the project footprint.

- Using a silt curtain for in-water work between April 15 and June 15 to help reduce potential adverse impacts from sediment plumes.

- Constructing the breakwater prior to dredging the basin to help contain potential sediment plumes.

- Coordinating construction of the harbor with the city of Sand Point and the Aleutian East Borough to avoid conflicts with subsistence activities.

- Development of a quarry development plan that would include limits on construction, disposal of quarry waste, necessary access and traffic routes, quarry rock stockpile area(s), and other stockpile areas for material to be used for quarry restoration. The plan would also include measures to control erosion and minimize adverse impacts from stormwater runoff. A coordinated agency review of the plan would be conducted, thus providing the opportunity for State and Federal agencies to place stipulations on the use of the quarry site.

- Complying with ADF&G standard blasting stipulations and coordinating a blasting plan, to include the use of an air curtain, with ADF&G, USFWS, and NMFS.

APPENDIX 2

CORRESPONDENCE

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
222 W. 7th Avenue, #43
Anchorage, Alaska 99513-7577

June 2, 1997

Guy R. McConnell, Chief
U.S. Army Engineer District, Alaska
Environmental Resources Section
P.O. Box 898
Anchorage, Alaska 99506-0898

RECEIVED

JUN 13 1997

REGULATORY FUNCTIONS BRANCH
ALASKA DISTRICT

Attn: Mr. Bill Abadie

Dear Mr. McConnell,

The National Marine Fisheries Service offers the following comment for consideration in an Environmental Assessment (EA) for harbor improvements in Sand Point, Alaska. Currently, NMFS has not reviewed any draft detailed project reports for this proposal and would like a copy, if available. Since attending an interagency meeting on March 13, 1997, NMFS has been investigating the discussed alternatives. NMFS believes the activity could have an impact on marine mammals, anadromous fishery resources, and marine habitat of the project area. As depicted, Alternatives 1 and 2 require the same considerations.

Marine Mammals are known to frequent Popof and Unga Straits. Various marine mammal species are found but are not exclusive to the project area. Steller Sea Lions have been sighted in the existing harbor, and are currently listed as an Endangered Species and protected under both the Endangered Species Act (ESA) and Marine Mammal Protection Act. The protection of marine mammals will need to be discussed including population densities, frequency, dependance and/or use of habitat, timing restrictions and use of explosives during construction, if applicable. NMFS will coordinate with your section and the U.S. Fish and Wildlife Service regarding these issues.

The marine waters, slough, and eel grass beds near the site may support returning adult migrations, juvenile out-migrations, and reproductive habitat for anadromous species of salmon. Also, these habitat areas my prove to be essential to salmon and other tidal, benthic, and juvenile forms of marine organisms, such as crab. These habitats need to be identified, located, and described in the EA.

The proposed dredging needs to be described in detail within the EA. NMFS assumes this would be accomplished with a dragline or barge mounted clamshell rather than by agitation or suction dredging, which would require special provisions to avoid water quality impacts.

Snumagin Corporation

P.O. Box 189
Sand Point, Alaska 99661
Phone (907) 383-3525, FAX 383-5356

June 13, 1997

Mr. Guy R. McConnell
Chief, Environmental Resources Section
Department of the Army
U.S. Army Engineer District, AK
P.O. Box 898
Anchorage, AK 99506-0898

Dear Mr. McConnell:

The Shumagin Corporation has reviewed the two prelimiary designs mentioned in your letter dated May 15, 1997, which are being considered for the proposed new boat harbor. The Corporation choses alternative two, Attachment A-3.

In the letter you mention that the majority of the dredged material from the harbor will be used as fill along the shoreline. Before the shoreline is filled, the Shumagin Corporation requests that land ownership of the fill area be determined.

Finally, besides fill material from the Dome Quarry, there may be some material below the quarry which may be used.

If you have any questions, please feel free to contact me at the above mentioned address or call at (907)383-3525.

Sincerely,

Raymond E. Nutt

Raymond E. Nutt
President

QAGAN TAYAGUNGIN TRIBE
P.O. BOX 447
SAND POINT, ALASKA 99661
(907) 383-5616

June 17, 1997

US Army Engineer District Alaska
CEPOA-EN-CW-ER ©
P.O. Box 898
Anchorage, Alaska 99506-0898

RE:

Dear Mr.McConnell:

In response to your letter dated May 15, 1997 regarding the new harbor improvements planned for Sand Point, Alaska. The Qagan Tayagungin Tribe is in support of Alternative 2 and supports the recommendations made by the Shumagin Corporation.

Please be advised that all future correspondence should be addressed to the tribes' President, as Mr. Glen Gardner is no longer on the tribal council. Should you have any questions please contact our office at 383-5616.

Sincerely,

Peggy N. Osterback

Peggy N. Osterback
Administrator

TONY KNOWLES, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF PARKS AND OUTDOOR RECREATION
OFFICE OF HISTORY AND ARCHAEOLOGY

3601 C STREET, SUITE 1278
ANCHORAGE, ALASKA 99503-5921
PHONE: (907)269-8721
FAX: (907)269-8908

June 23, 1997

File No.: 3130-1R COE

Subject: Sand Point Harbor Improvements

Guy R. McConnell, Chief
Environmental Resources Section
U.S. Army Engineer District, Alaska
ATTN: CENPA-EN-PL-ER (Abadie)
P.O. Box 898
Anchorage, AK 99506-0898

Dear Mr. McConnell;

Thank you for your letter on the referenced project. The shoreward portions of the area of potential effect was archaeologically surveyed by Department of the Army personnel in 1984. No sites were found. Therefore, we concur with your finding that there are no historic properties in the area of potential effect.

Please contact Tim Smith at 269-8722 if there are any questions or if we can be of further assistance.

Sincerely,

Judith Bittner

Judith E. Bittner
State Historic Preservation Officer

JEB:tas

City of Sand Point

October 29, 1997

Mr. Guy R. McConnell
Chief, Environmental Resources Section
Department of the Army
U.S. Army Engineer District, Alaska
P.O. Box 898
Anchorage, Alaska 99508-0898

Re: Sand Point Harbor Expansion

Dear Mr. McConnell,

At a Special Meeting of the Sand Pont City Council held on October 8, 1997, Resolution 97-36, a Resolution of the City of Sand Point Endorsing Plan 1-C as the Desired Harbor Expansion Plan was passed and adopted by a duly constituted quorum of the Sand Point City Council.

Should you have any questions please feel free to contact the City offices Monday – Friday 8:00 a.m. to 4:00 p.m..

Sincerely,

Barbara J. Wilson

Barbara J. Wilson
City Clerk

Enclosure (1)

cc: Mayor Gundersen
City Administrator

City of Sand Point

RESOLUTION 97-36
A RESOLUTION OF THE CITY OF SAND POINT ENDORSING PLAN 1-C AS THE DESIRED HARBOR EXPANSION PLAN

WHEREAS: the City of Sand Point desires to expand it's harbor to accommodate the larger fishing vessels, and

WHEREAS: Sand Point is the largest home port for the fishing fleet between Unalaska and Kodiak, and

WHEREAS: the present harbor does not have the room nor the ability to accommodate boats in excess of 100 feet, and

WHEREAS: the homeporting of the fishing fleet in Sand Point increases local commerce and encourages local economic diversification, and

WHEREAS: the City Council has reviewed the three proposed harbor expansion plans as prepared by DOT/PF and the Corps of Engineers.

NOW THEREFORE BE IT RESOLVED THAT the City of Sand Point endorses Plan 1-C as the desired harbor expansion plan and configuration.

PASSED AND ADOPTED BY A DULY CONSTITUTED QUORUM OF THE CITY COUNCIL FOR THE CITY OF SAND POINT THIS 5th day of October, 1997.

Mayor

ATTEST

City Clerk

APPENDIX 3

U.S. FISH AND WILDLIFE SERVICE
COORDINATION ACT REPORT

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services Anchorage
605 West 4th Avenue, Room 62
Anchorage, Alaska 99501

Received 12/3/97

IN REPLY REFER TO:

WAES

DEC - 2 1997

Colonel Sheldon A. Jahn
District Engineer
Alaska District, Corps of Engineers
Post Office Box 898
Anchorage, Alaska 99506-0898

Re: Final Fish and Wildlife
Coordination Act Report:
Sand Point Harbor Project

Dear Colonel Jahn:

The enclosed Fish and Wildlife Coordination Act (FWCA) report constitutes the U.S. Fish and Wildlife Service's final report on the U.S. Army Corps of Engineers' (Corps) proposed addition to moorage facilities at Humboldt Harbor, Sand Point, Alaska. The document was prepared in accordance with the fiscal year 1997 scope of work and the Fish and Wildlife Coordination Act [PL 85-624 Section 2 (b)]. The document also contains information on threatened and endangered species, pursuant to Section 7 of the Endangered Species Act of 1973, as amended.

Findings herein are based on project information provided by your staff and a site investigation. We received comments on our draft report from your staff, the National Marine Fisheries Service, and the Alaska Department of Fish and Game. Changes were made in our report as a result of these comments.

This report includes recommendations to offset the loss of approximately 21 acres of high to medium value aquatic habitat. We recently met with Guy McConnell and William Abadie of your staff to discuss mitigation opportunities for this project (November 7, 1997). Unfortunately, we were not able to come to agreement at the meeting regarding mitigation related to this project.

Service recommendations for aquatic habitat mitigation are based on scientific assessments of habitat function and it's historical, present, and future value to fish and wildlife resources. On occasion, it is not practicable to recommend in-kind, on-site mitigation and other creative avenues are recommended instead. In the case of Sand Point, both the Service and your staff agree that trying to replace lost eelgrass beds and benthic habitat on site would be logistically difficult and is not likely to be successful. Related mitigation opportunities have been discussed with your staff at length. These include, out-of-kind and off-site projects such as providing funds for fox removal

SAND POINT HARBOR EXPANSION PROJECT
Sand Point, Alaska

FINAL
Fish and Wildlife Coordination Act Report

Prepared by: Laurie Fairchild

U.S. Fish and Wildlife Service
Anchorage Field Office
605 W. 4th Ave Rm G62
Anchorage, Alaska 99501

November 1997

TABLE OF CONTENTS

List of Figures

SUMMARY

This report constitutes the U.S. Fish and Wildlife Service's (Service) report on the U.S. Army Corps of Engineer's (Corps) proposed harbor expansion project at Sand Point, Alaska. It has been prepared under the authority of the Fish and Wildlife Coordination Act, P.L. 85-624 Section 2(b), and in keeping with the spirit and intent of the National Environmental Policy Act. This report will be included with the Corps' Environmental Assessment for the proposed project.

A Fish and Wildlife Coordination Act (FWCA) report was completed for the proposed project in 1985, and a Planning Aid report was completed in 1994 as the Corps continued it's feasibility studies and alternatives analysis. The harbor expansion has been determined by the Corps to be feasible at only one site, Black Point, but several design alternatives for the site have been proposed. Black Point was the location designated in the 1985 FWCA report as providing the most diverse and valuable habitat for fish and wildlife resources of the site alternatives evaluated then.

The purposes of the Service's continued involvement are 1) to evaluate the principal alternative's potential impacts on fish and wildlife resources and their habitats; and 2) to recommend methods for mitigating adverse impacts in line with the Service's Mitigation Policy. This FWCA report provides the Service's current position on the proposed project, taking into account changes in project design and additional habitat information gathered since the last planning efforts.

The Service believes harbor expansion can occur at Black Point without significantly affecting local sea otter populations. However, highly productive benthic habitat will be totally altered within the project footprint and secondary impacts will occur. Consequently, the Service would object to the project moving forward without mitigation for the loss of up to 21 acres of intertidal and adjacent habitat. Several mitigation possibilities are proposed that would adequately offset these losses.

INTRODUCTION

The village of Sand Point is located south of the Alaska Peninsula in the Shumagin Islands, on Popof Island near the mouth of Humboldt Slough (Figure 1). Humboldt Harbor, built in 1976, lies on the south side of Humboldt Slough across from Sand Point. Although existing harbor facilities have been largely adequate for community needs, increased transient vessel traffic has created a need for additional mooring space.

In 1981, increased fishing activity in the area prompted the local government to request that the Corps of Engineers investigate the feasibility of expanding harbor facilities. Originally, five alternate locations were identified by the Corps as potentially suitable for harbor expansion (Figure 2). Each location presented construction challenges and associated environmental impacts. Mud Bay, Popof Bay and Sand Point Spit were eliminated as feasible alternatives for reasons listed in Table 1. Expansion and/or modification of the existing harbor and construction at Black Point were the alternatives the Service was asked to evaluate in its 1985 FWCA report. Analysis of the remaining alternatives led the Service to recommend modification of Humboldt Harbor as the least environmentally damaging alternative. After analysis of dive surveys and wildlife inventories in the area, the Service concluded Black Point was high to medium value for sea otters and rearing pink salmon and should be avoided.

The Service completed another environmental impacts analysis in a Planning Aid report in 1994. That report was included in the Corps Reconnaissance Report (RR) for the project based on three designs for the existing harbor and one alternative located at Black Point. The RR concluded that none of the four proposed alternatives were economically feasible and the project should not be pursued further. As a result, the Aleutians East Borough contracted its own economic analysis of possibilities for improving the Sand Point harbor and requested that the Corps reevaluate the proposed project.

The Corps performed a more in-depth analysis and published (April 1996) the results in a supplement to the 1995 RR. Only one alternative was considered in the supplement, Alternative 3, the expanded harbor without dogleg. The Corps' 1996 supplement concluded that this alternative was economically feasible if the number of vessels which could be accommodated in the harbor was increased. This development allowed the Corps to restart the project and in-depth consideration of the other alternatives discussed in the 1995 RR. During this investigation, it was determined that the City of Sand Point had already reconfigured Humboldt Harbor to accommodate as many vessels as possible; therefore, alternatives were further narrowed to construction at Black Point, with several harbor configurations proposed (pers. comm. Janis Kara, 1997).

PROJECT DESCRIPTION

In September, 1996, the Corps again contacted the Service regarding project status. The Service was contracted to re-evaluate the proposed alternatives, based on updated habitat and

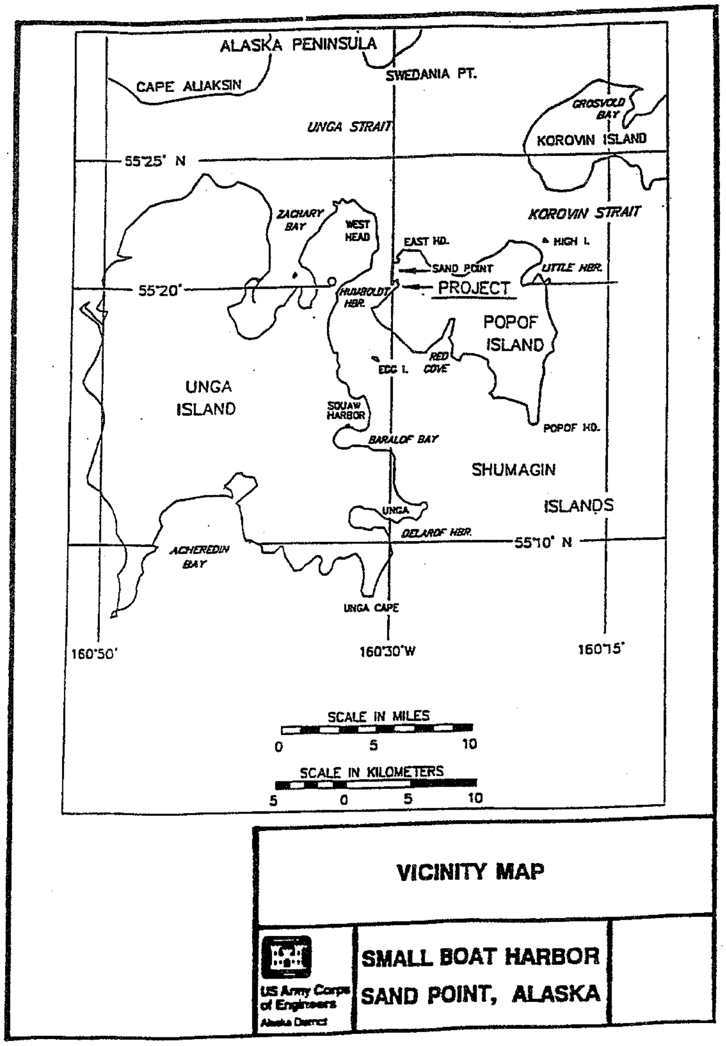
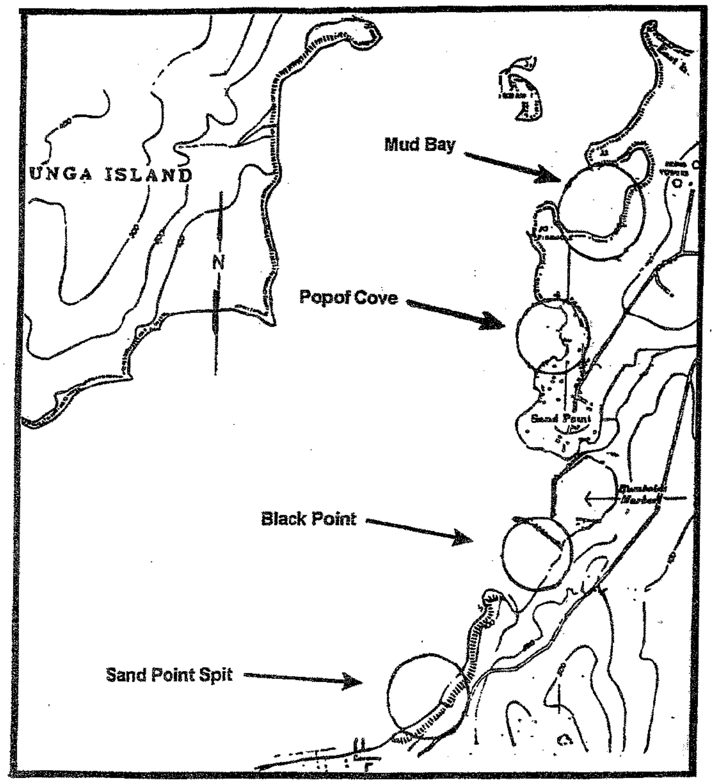

ALASKA PENINSULA
CAPE ALIAKSIN
SWEDANIA PT.
UNGA STRAIT
GROSVOLD BAY
KOROVIN ISLAND
55°25' N
KOROVIN STRAIT
ZACHARY BAY
WEST HEAD
EAST HD.
HIGH I.
SAND POINT
LITTLE HBR.
55°20'
HUMBOLDT HBR.
PROJECT
POPOF ISLAND
RED COVE
EGG I.
UNGA ISLAND
SQUAW HARBOR
BARALOF BAY
POPOF HD.
SHUMAGIN ISLANDS
UNGA
DELAROF HBR.
55°10' N
ACHEREDIN BAY
UNGA CAPE
160°50'
160°30'W
160°15'
SCALE IN MILES
0 5 10
SCALE IN KILOMETERS
5 0 5 10
VICINITY MAP
US Army Corps of Engineers
Alaska District
SMALL BOAT HARBOR
SAND POINT, ALASKA

FIGURE 1.



ALTERNATIVE SITES
SMALL BOAT HARBOR, SAND POINT, ALASKA

FIGURE 2.

Table 1. Eliminating factors for three small boat harbor locations (as provided by the U.S. Army Corps of Engineers).

Mud Bay	Popof Bay	Sand Point Spit
- 1.5 miles from existing harbor - zoned residential - shallow depths w/rock substrate - considerable eelgrass beds - 20 to 40 acre impact - no existing industrial infrastructure - not supported by community	- 1 mile from existing harbor - zoned residential; existing houses - shallow depths; substantial breakwater construction - 27 acre impact - no existing industrial infrastructure - not supported by community	- 1.25 miles from existing harbor - zoned open space - deep water limiting harbor size - difficult access

wildlife information. Consequently, this report details the results of the environmental impacts analysis and recommended mitigation for two designs at Black Point.

Alternative 1. This design incorporates the south breakwater of Humboldt Harbor by extending it 570 feet to the southwest to create a mooring basin. A separate, 730-foot breakwater would extend from shore northeast of Black Point itself and run roughly parallel to and partially overlapping the extended breakwater, creating a protected entrance channel (Figure 3). This design could accommodate approximately 30 vessels up to 165 feet in length. A sufficient staging area exists at the site from previously filled tideland to accommodate construction.

The total project footprint is projected at 19 acres, including approximately 8 acres dredged, 2.9 acres storage/access area, 4 acres covered by new breakwater, and 4.1 acres intertidal fill. Dredging would occur by clamshell from a barge. Dredged material would be placed in a previously permitted area near the existing harbor, along the shore of the proposed harbor to construct the storage/access area, and in the northwest corner of the new basin at depths in excess of -20 feet MLLW. Humboldt Harbor has required maintenance dredging once in 17 years; the new basin is expected to require similarly infrequent service.

Breakwater rock would likely be obtained from Dome Quarry, located on uplands adjacent to the site. An access road runs between the quarry and Sand Point; a new road has been discussed, but not included in project plans, that would cut down the steep hillside between the quarry and the project site. This would significantly shorten the driving time between sites but significantly increase problems of erosion and deposition of sediment into the nearshore environment. Blasting in the proposed harbor area is a possibility but cannot be confirmed until construction begins.

Alternative 2. This alternative is similar to Alternative 1, extending the south breakwater 980 feet to form the northwest side of the new harbor. A 370-foot breakwater would extend northwest and form the inner (eastern) wall of the entrance channel (Figure 4). The new breakwater would be located farther north and east of the Black Point outcropping. The total footprint for this alternative is slightly larger, 21 acres, and the mooring basin would accommodate 35 vessels as compared to 30 vessels in Alternative 1.

Dredged material would be disposed in the same areas described for Alternative 1. Similarly, Dome Quarry would provide the breakwater rock and blasting may be necessary.

FISH AND WILDLIFE RESOURCES

Numerous reports by the Service and Corps have documented the fish and wildlife resources of Sand Point and Humboldt Harbor. Scuba surveys were conducted in 1984 and 1997 and provide a key to aquatic plant and invertebrate species at Black Point. Eelgrass beds and abundant aquatic vegetation characterize the area from Mud Bay to Black Point. Biologists conducting the 1997 site investigation noted Mud Bay had particularly dense eelgrass beds.

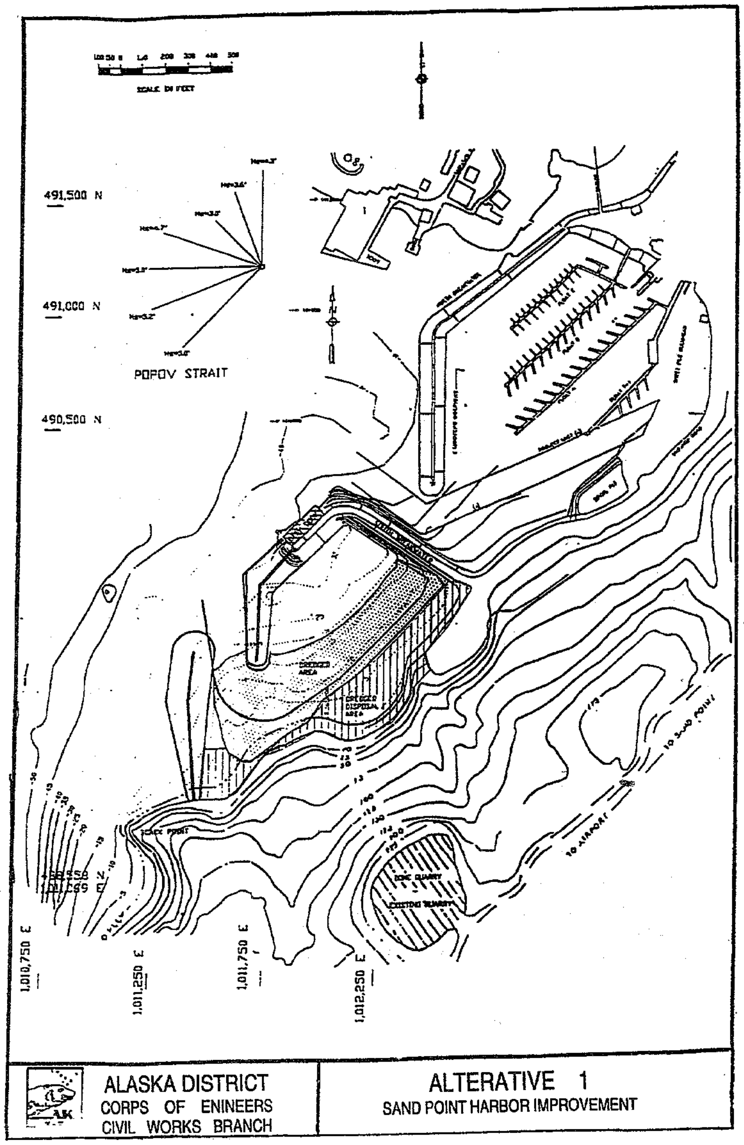

491,500 N
491,000 N
490,500 N
POPOV STRAIT
1,010,750 E
1,011,250 E
1,011,750 E
1,012,250 E
ALASKA DISTRICT
CORPS OF ENINEERS
CIVIL WORKS BRANCH
ALTERATIVE 1
SAND POINT HARBOR IMPROVEMENT

FIGURE 3.

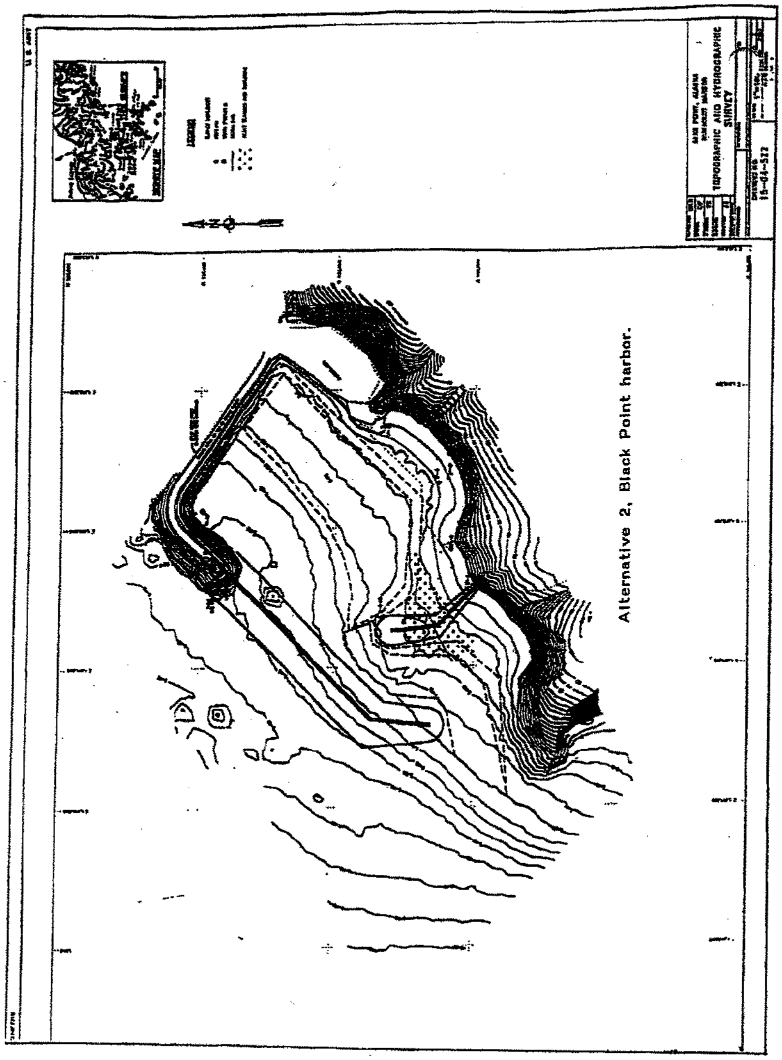


FIGURE 4.

MARINE RESOURCES

Due to muddy substrate, marine fauna was limited in a large part of the existing harbor. Of those invertebrate species found during sampling, polychaete worms were the most abundant. Cobble and gravel with a thin overlay of silt are typical of the harbor entrance, and evidence of sea otter feeding (digs) was common in this area in 1984. A dive survey was not conducted inside the existing harbor in 1997 because 1) it was assumed that sand/silt conditions would remain largely unchanged; and 2) the focus of the Corps' proposed construction and associated impacts was concentrated at Black Point.

Black Point, the proposed harbor site, is much more diverse in habitat and aquatic species than the existing harbor. In 1984, dive surveys showed the habitat consisted of gravel and rock cobble covered by dense patches of blue mussel and rockweed in the intertidal zone. Four species of bivalve were common in the area and sea cucumbers and polychaetes were abundant. Sampled tide pools were vegetated with eelgrass and contained littorine snails, mussels, barnacles, limpets, numerous sculpins, and hermit crabs. Subtidal vegetation and aquatic invertebrates were also diverse and abundant (Appendix A).

The 1997 dive surveys (Appendix B) repeated Transects 1 and 2 from 1984. Substrate profiles were similar to 1984 results but several vegetation changes were noted. Specifically, only one small eelgrass bed occurred along the two transects in 1997 while eelgrass beds were "scattered" along transect 1 in 1984. Divers in 1997 noted that while eelgrass did occur off-transect, its overall occurrence in the survey area had declined. The rocky substrate at the proposed harbor site continued to support an abundance of brown algae, marine gastropods and bivalves (nearshore), marine invertebrates and red algae (subtidal).

Sea otter digs were frequently observed at the mouth of Humboldt Harbor and at the Black Point survey sites during 1984 dives. Although no otters were observed, otter-predated clam shells were also noted in 1997. Local information suggests that otters have moved away from Black Point in recent years. This may be misleading as Service biologists conducting sea otter surveys at Yakutat Bay noted otters tend to cluster together, so an area may contain a group of sea otters one day and none the following day (pers. comm. Angela Doroff, 1997). Male otters are always looking for good territories and Black Point provides the sort of productive habitat they would find attractive.

FISH

Four species of marine fish were collected during Service studies in May 1983 at Black Point (Ferrell, 1984). Nearby Humboldt Creek supports a run of coho salmon, pink salmon and Dolly Varden. Nearshore waters support substantial concentrations of juvenile pink salmon. Beach seines in May 1983 captured young-of-the-year pink salmon at Sand Point Spit near Black Point. Pink salmon spawning is also known to occur in several unnamed streams on the north side of Popof Island. ADF&G has identified the nearshore waters of Black Point as valuable to rearing salmon moving along the coastline (pers. comm., Wayne Dolezal).

Rock fish were noticeably more abundant in 1997 and displayed defensive behavior, an indication the area provides breeding habitat for this species. Rock greenling, red Irish lord, brown rockfish, and copper rockfish were all absent from surveys conducted for the 1985 FWCA report but were common/abundant in 1997. This may be partially due to timing of the dives, as those in 1997 were conducted almost a month later than the 1984 surveys.

BIRDS

Eighteen species of birds have been observed in the project area. Bald eagles roost at Black Point and occasionally at the City dock, and feed on seafood wastes produced by a nearby cannery. No bald eagle nests have been observed in the project area. Seaducks and other birds use the area for feeding and resting; species observed in the area include harlequin ducks, oldsquaws, pigeon guillemots, and black-legged kittiwakes. Steller's eiders, white-winged scoters, buffleheads, and mergansers also frequent the area.

Several waterbird species attracted to the abundance of invertebrate prey found at Black Point are in decline. Harlequin ducks, the Alaskan population of marbled murrelets, and Kittlitz's murrelets are currently being studied to assess population trends.

THREATENED AND ENDANGERED SPECIES

The Alaska breeding population of Steller's eider has recently been listed as threatened under the Endangered Species Act of 1973, as amended. Sand Point is a wintering area and is along the spring and fall migration routes for the Steller's eider. These birds feed on invertebrates found in proximity to eelgrass beds, such as those located at Black Point.

The Steller sea lion, under the National Marine Fisheries Service's (NMFS) jurisdiction, is listed as endangered under the ESA. No haulouts occur in the project vicinity, although individuals have been observed near Sand Point.

PROJECT IMPACTS

Alternative 1. Approximately 21 acres of sub- and intertidal habitat would be directly lost to harbor construction through dredge and fill activities. Breakwater construction would result in suspended sediments in the water column which would spread outside the project footprint. Suspended sediment from dredging should be relatively contained because it is scheduled to occur after breakwater construction. If breakwater construction occurs over a long period of time, sediments settling over undisturbed marine vegetation could inhibit growth and smother benthic invertebrates. Extremely slow siltation rates observed in the existing harbor and surrounding waters suggest that benthic species would not be well adapted to rapid changes in their surroundings and may not escape sedimentation from construction quickly enough to survive. The new mooring basin will likely not be recolonized with species comparable in diversity to pre-project conditions because substrate and depth will both be substantially modified. Disturbance-tolerant species may become re-established in the mooring basin but are not likely to be heavily predated due to fairly constant vessel activity. If bivalve and sea urchin populations are reduced due to dredging associated with Alternative 1, sea otters and other predator species will be forced to forage farther away from the harbor or compete with those animals already using nearby Black Point.

The 1985 FWCA report discussed the loss of biomass as an environmental impact. The 1997 dive surveys indicate that the intertidal and subtidal areas are at least as productive as documented in the 1984 survey, if not more so (with the exception of eelgrass beds). Based on infaunal biomass calculations for approximately 25 acres of Black Point habitat, an estimated 58.6 tons of biota, including 7 acres of eelgrass beds, would be eliminated by dredging the mooring basin and entrance channel (1985 FWCA report). Using the same formula, an estimated 42 tons of biota (19 acres) will be lost to dredge and fill activities in the proposed project.

Alternative 2. Impacts associated with Alternative 2 are very similar to those in Alternative 1: 1) direct loss of approximately 21 acres of sub- and intertidal habitat; 2) sedimentation of adjacent sea floor during construction; and 3) loss of aquatic species diversity and abundance in the project area.

DISCUSSION

The most significant environmental impacts will stem from breakwater construction, dredging activities, and intertidal fill. Both alternatives are similar in potential adverse impacts.

Mitigation

The Service has responsibilities under the Fish and Wildlife Coordination Act and the National Environmental Policy Act to identify impacts and make recommendations that, if implemented, would insure project related losses to fish and wildlife resources are mitigated. Based on information about the fish and wildlife resources in the project area and consideration of resources that will be reduced or eliminated by the proposed project, the Service has identified the following species to assess the environmental impacts of the project, establish mitigation goals, and develop a mitigation plan: 1) pink salmon; 2) sea otter; and 3) harlequin duck. Pink salmon and sea otters were evaluation species in 1985 as well.

Criteria used to determine habitat value for an evaluation species include relative abundance, distribution, and productivity of the species within the project area. Black Point was considered of high to medium value for sea otters in 1985, given the abundance of otter digs and presence of prey species such as butter and littleneck clams. Black Point was also considered high to medium value habitat for rearing pink salmon, providing cover in the shallow nearshore zone and an adequate food source. These designations remain valid for the currently proposed project.

The harlequin duck was chosen as an evaluation species because they also depend on nearshore resources for food and resting areas. Harlequin duck prey includes crustaceans, mollusks, and small fish. They are often seen in small groups standing in shallow, rocky water or perching on rocks at the tide's edge. The Black Point area provides intertidal habitat and ample food resources for this species. Consequently, Black Point would be categorized as high to medium value for harlequin ducks.

Samples were taken at Humboldt Harbor in 1984 to assess the degree of recolonization of a new breakwater and mooring basin and the diversity of species compared to Black Point. That study found that recolonization would "...not fully mitigate for the elimination of habitat filled and the degradation of habitat altered by dredging." Avoidance of adverse environmental impacts is typically the first step in mitigation. In this case, avoidance is not possible because: 1) the existing harbor has been expanded as much as possible to accommodate the need for additional mooring space; and 2) locating the proposed harbor at one of the other previously investigated sites would result in similar, if not greater, impacts to fish and wildlife resources.

The Service's mitigation goal for resources of high to medium value for the evaluation species that are relatively abundant on a national basis (Resource Category 3) is no net loss of habitat value while minimizing loss of in-kind habitat. In-kind replacement is preferred for habitat in this category but not feasible for this particular project. Substituting or increasing management of different habitats is a possible method to attain the mitigation goal in this case.

The probability of successful mitigation is a consideration when determining the least environmentally damaging project alternative. The Service has consistently stated that mitigation would be required to replace lost fish and wildlife resources if the Corps were to select an area of high productivity, such as Black Point, as the preferred alternative. The 1984 PA report suggested a fish pass structure be built at Apollo Creek, on Unga Island, as mitigation. This project was also mentioned in a trip report by the Corps, in recognition of the need for mitigation of high value habitat if the project were to be built at Black Point. Additional mitigation recommendations in 1985 included:

- off-site mitigation for anadromous salmon habitat at Humboldt Creek;

- post-project construction follow-up studies conducted to assess the extent and rate of recolonization of any new breakwater, mooring basin and dredged material disposal areas. Biomass and density of benthic infauna should be measured over time and compared to pre-project conditions. The purpose of this follow-up study would be to refine estimates of unavoidable losses, modify mitigation recommendations as necessary, and to compare the results with other Corps boat harbor projects;

AND

- development of a mitigation plan by the Corps, Service, NMFS, and ADF&G before the FWCA was finalized to ensure mitigation occurred concurrent with project construction.

Recent mitigation discussions between Corps and Service biologists have included:

- reviewing off-site mitigation at Humboldt Creek. The project is very expensive and there is local opposition. Because this option did not have strong agency support, it was eliminated from further discussion.

- developing a 2- to 3-year seasonal survey for waterbirds. Sand Point is logistically difficult to reach and survey in a short period. At least one year-round resident has been identified who may be capable of and interested in taking on this task. Data would be put in report form and forwarded to the Service, Corps, NMFS, and ADF&G. If further harbor development or expansion were to occur at Sand Point in the future, this information would be essential to

- developing and implementing post-construction follow-up studies similar to the ones discussed in the 1985 report. The study would aid harbor impact assessments and projection of secondary and cumulative impacts for future Corps projects.

- establishing eelgrass beds in suitable areas off-site to replace those lost to construction. This idea was eliminated because of the relative abundance of eelgrass beds in the area and inherent difficulty in transplanting or seeding eelgrass beds.

- eradicating fox on nearby islands by providing funds to Alaska Maritime National Wildlife Refuge's program to remove introduced populations from the Aleutian Islands.

In addition, biologists conducting the 1997 survey noted that Mud Bay was a unique resource and should be protected. Establishing a conservation easement to protect Mud Bay resources would also meet the mitigation goals for the proposed project.

RECOMMENDATIONS

Mitigation recommendations in previous reports were based on the assumption that several locations were feasible for harbor construction. The Corps has narrowed their alternatives to one location: Black Point. Therefore, some of the previous recommendations are no longer applicable.

Biologists from the Corps, Service, ADF&G, and NMFS met on September 16, 1997, to discuss mitigation possibilities for the project and other outstanding concerns. NMFS did not have an objection to the harbor project but suggested that oil, plastic, and used net collection sites be installed. The other agencies agreed this was a worthwhile idea. Another road to/from Dome Quarry for harbor construction was opposed by all agencies due to continued erosion and siltation that would adversely impact water quality, benthic habitat, and juvenile salmon (gill abrasion). The following list contains the Service's recommendations to mitigate for the reduction in fish and wildlife habitat value that will result from harbor construction at Black Point:

1. Develop and implement post-construction follow-up studies to refine estimates of unavoidable losses and compare the results with other Corps boat harbor projects **OR** develop and implement alternative mitigation agreeable to the appropriate resource agencies and the Corps.

2. A new road between Dome Quarry and the project site should not be built. Potential for adverse impacts to fish and wildlife resources via decreased water quality outweigh any logistical benefits.

3. Any blasting that occurs shall adhere to guidelines provided by NMFS (with concurrence from the Service and ADF&G). ADF&G shall be contacted for timing restrictions on blasting to protect fish resources in the nearby area. During the period April 15 through June 15, a silt curtain shall be placed before and during any in-water work to prevent gill-abrasion and siltation of surrounding aquatic habitat.

LITERATURE CITED

Fairchild, L. A. 1994. Sand Point Harbor Expansion Project, Sand Point, Alaska. Planning Aid Report. U.S. Fish and Wildlife Service. 18 pp.

Ferrell, D.L. 1984. Sand Point Small Boat Harbor Planning Aid Report, Sand Point, Alaska. U.S. Fish and Wildlife Service. 17 pp.

Ferrell, D.L. 1985. Sand Point Small Boat Harbor Draft Fish and Wildlife Coordination Act Report, Sand Point, Alaska. U.S. Fish and Wildlife Service. 27 pp.

Noble Consultants, Inc. 1994. Coastal Engineering Analysis for Sand Point Harbor Design Studies, Draft Report, Sand Point, Alaska. (for) U.S. Army Corps of Engineers, Alaska District. 35 pp.

U.S. Army Corps of Engineers. 1981. Small Boat Harbor Section 107 Reconnaissance Report, Sand Point, Alaska. Alaska District, Anchorage. 29 pp.

U.S. Army Corps of Engineers. 1994. Trip Report on reconnaissance stage general investigation study, Sand Point Boat Harbor expansion. Memorandum dated May 4, 1994, Alaska District, Anchorage.

U.S. Army Corps of Engineers. 1995. Reconnaissance Report for Boat Harbor Improvements, Sand Point, Alaska. Alaska District. 63 pp.

U.S. Army Corps of Engineers. 1996. Reconnaissance Report for Boat Harbor Improvements, Sand Point, Alaska, (supplement). Alaska District. 19 pp.

Personal Communications

Doroff, Angela. August 14, 1997. U.S. Fish and Wildlife Service. Biologist.

Kara, Janis. August 12, 1997. U.S. Army Corps of Engineers. Project Manager.

APPENDICES

A. Scuba survey, 1984.

B. Scuba survey, 1997.

C. U.S. Fish and Wildlife Service Mitigation Policy.

D. Agency comments

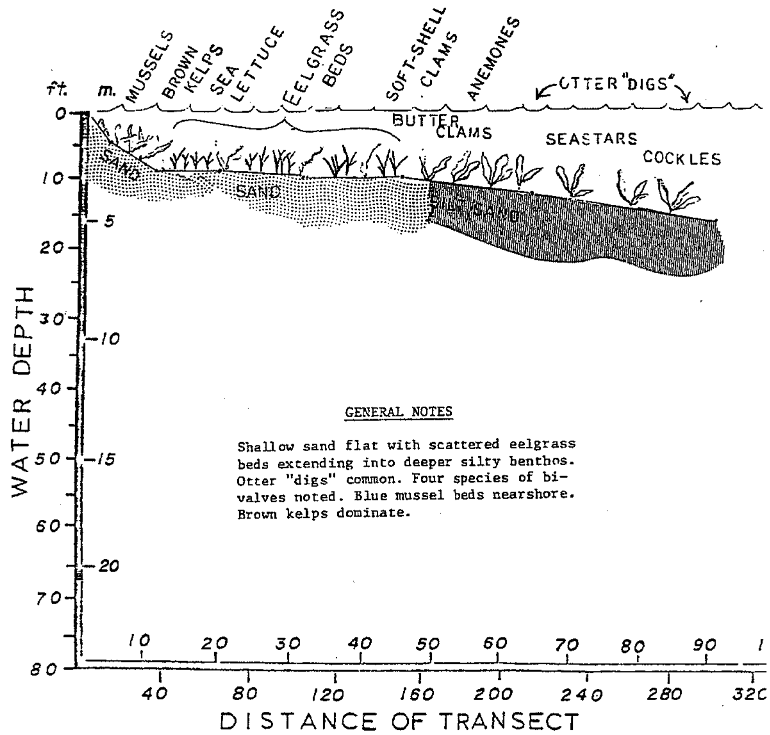
APPENDIX A

SUBTIDAL TRANSECTS OF THE
SAND POINT, ALASKA BOAT HARBOR
(HUMBOLDT HARBOR)

April 1984

TRANSECT 1. SCUBA Transect through the inner mooring basin of the Sand Point Small Boat Harbor

DATE: 4/29/84
TIME: 0945
BEARING: 310° M
TIDE: +0.7' @ C

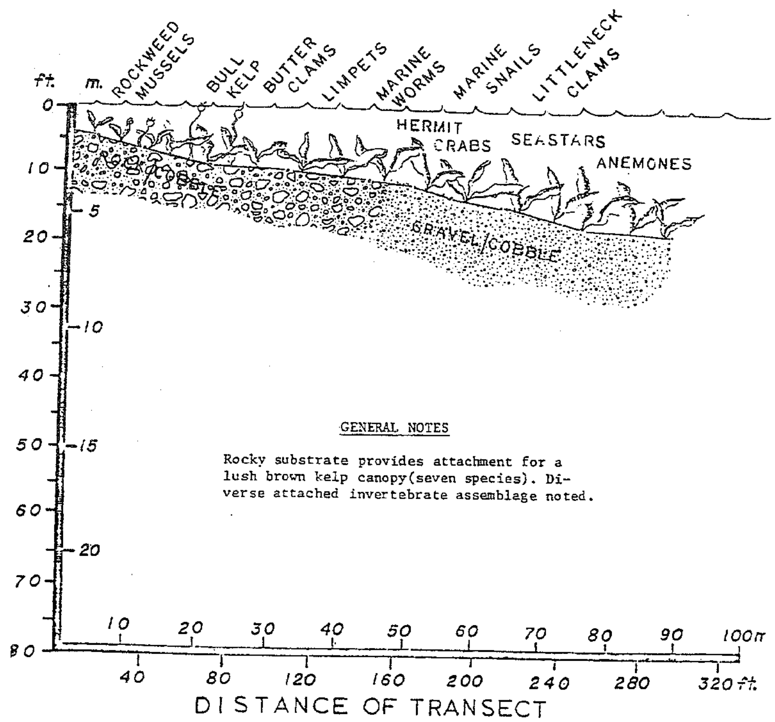


GENERAL NOTES

Shallow sand flat with scattered eelgrass beds extending into deeper silty benthos. Otter "digs" common. Four species of bivalves noted. Blue mussel beds nearshore. Brown kelps dominate.

TRANSECT 2. SCUBA Transect through the middle of the mooring basin of the Sand Point Small Boat Harbor

DATE: 4/29/84
TIME: 1105
BEARING: 330 Mag
TIDE: +0.7 @ 071.

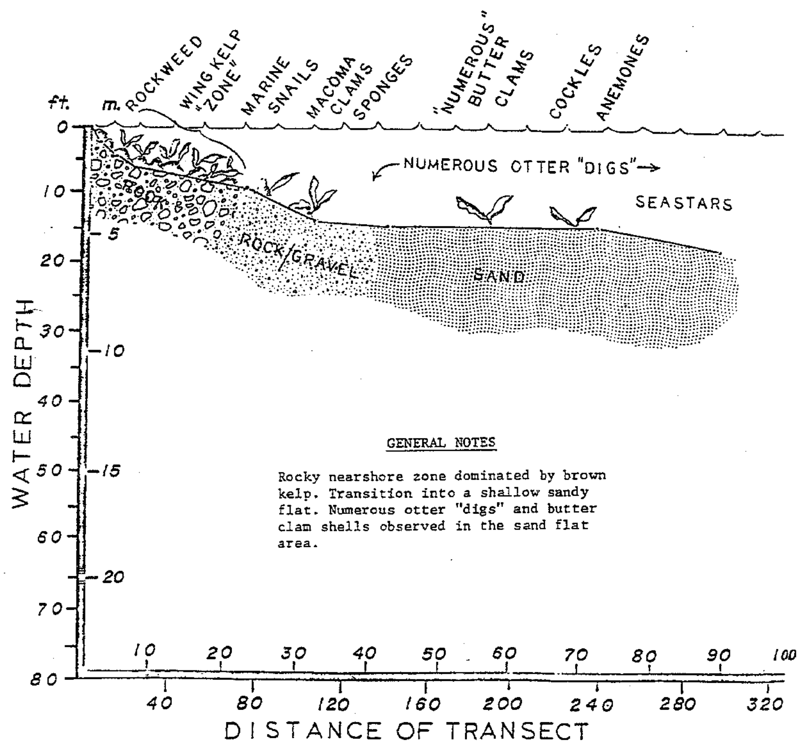


GENERAL NOTES

Rocky substrate provides attachment for a lush brown kelp canopy(seven species). Diverse attached invertebrate assemblage noted.

TRANSECT 3. SCUBA Transect through the entrance channel of the Sand Point Small Boat Harbor

DATE: 4/29/84
TIME: 1200
BEARING: 270 Mag
TIDE: +0.7 @ 071



GENERAL NOTES

Rocky nearshore zone dominated by brown kelp. Transition into a shallow sandy flat. Numerous otter "digs" and butter clam shells observed in the sand flat area.

INFAUNAL AND EPIFAUNAL INVESTIGATION, BLACK POINT AND HUMBOLDT HARBOR, SAND POINT, ALASKA
May 1984

PURPOSE

Investigations were conducted to provide comparative information on the presence, species compostion, biomass and density of marine benthic infauna at the Black Point Site and within the existing Humboldt Small Boat Harbor. Statistical differences in density and biomass between infaunal populations within the boat harbor and within the adjacent project area were computed to assess project-related impacts and predict trends in shifts of species composition and infaunal recolonization after harbor construction.

METHODS

A simple random non-stratified sampling design was utilized to select 20 stations (10 at each alternative site) by overlaying a transparent grid sheet on a map of the study area. Each grid was assigned a sequential number from which the sample stations were selected using a random numbers table. In the field each sample station was then marked by a small buoy. A diver, using standard sport-diving SCUBA equipment, placed a 0.25 m^2 stainless steel cylindrical template on the benthos directly over the buoy weight. The template was worked into the substrate to a depth of approximately 30 cm or refusal. The substrate material and organisms from within the template were collected using a diver-operated Venturi action Keene suction gold dredge (Brett, 1964). Water was forced through the dredge by a centrifugal pump driven by an eight horsepower gasoline engine mounted in a skiff. The pump was connected to the dredge by 20 m of 38-mm diameter vinyl hose. A 6 mm^2 mesh bag was attached to the exhaust end of the dredge to collect the sample.

The samples were rough-sorted in the field, fixed in formalin, and washed through a 3 mm^2 screen in the laboratory. References used for identification of specimens include Abbott (1974), Barr (1983), Kozloff (1974), and Morris (1966). Infaunal specimens were enumerated (except individual polychaetes) and the composite whole-wet-weight of all individuals (including shells) of each species in the sample was determined to the nearest 0.1 gram with a Sauter K-1200 balance. Table 1 lists the date, time, water depth, and substrate type at each sampling station.

RESULTS

Infaunal Biomass

The composite biomass results by species for each sampling station for Humboldt Harbor and Black Point are listed in Table 2. The mean biomass estimate (all infaunal organisms) for Humboldt Harbor was 285.7 g/m^2. The mean biomass estimate for Black Point was 418.6 g/m^2. The dominant infaunal organism (in terms of biomass) in Humboldt Harbor was *Macoma* spp.

able 2 Biomass of Infaunal Species in Grams for each 0.25 m2 Dredge Sample in Humboldt Harbor and Black Point, Sand Point, Alaska

INFAUNAL ORGANISM	HUMBOLDT HARBOR SAMPLING STATIONS 1	2	3	4	5	6	7	8	9	10	COMPOSITE WEIGHT (all samples)	PERCENT OF COMPOSITE WEIGHT	BLACK POINT SAMPLING STATIONS 1	2	3	4	5	6	7	8	9	10	COMPOSITE WEIGHT (all samples)	PERCENT OF TOTAL WEIGHT
axidomus giganteus	-	1.7	0.8	3.9	0.3	3.3	-	2.0	8.5	3.4	23.9	3.3	13.9	33.9	64.3	72.1	16.9	5.8	60.3	127.1	7.1	300.0	709.4	67.8
acoma spp.	6.9	100.9	2.9	59.4	56.5	97.9	39.8	78.7	23.0	6.0	472.0	66.1	0.3	2.0	3.0	4.6	0.7	8.4	0.7	5.7	65.6	-	91.0	8.7
rotothaca staminea	-	15.3	3.3	3.0	1.1	-	-	12.9	1.1	3.6	40.3	5.6	0.6	24.1	36.0	1.2	-	19.4	-	0.1	-	-	81.4	7.8
ya truncata	-	0.6	4.6	-	0.3	7.6	-	1.0	3.0	-	17.1	2.4	0.5	1.5	-	-	13.8	-	-	-	24.1	-	39.9	3.8
usculus spp.	-	-	0.1	-	-	0.1	-	2.4	0.2	0.3	3.1	0.4	-	-	-	-	-	-	0.1	-	-	-	0.1	0.01
olida spp.	-	-	-	-	0.5	-	-	1.9	-	-	2.4	0.3	-	-	0.6	-	-	-	-	-	0.6	-	1.2	0.1
linocardium nuttallii		-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	-	-	0.7	-	-	-	0.9	0.09
starte spp.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21.5	-	-	-	-	-	-	21.5	2.1
echis caupo	52.4	-	33.0	-	-	-	13.5	0.8	-	8.7	108.4	15.2	-	-	-	-	19.5	-	-	-	-	-	19.5	1.9
olychaete (all species)	3.8	1.7	1.7	1.0	2.6	22.8	1.6	4.0	-	7.8	47.0	6.6	4.1	42.3	23.7	2.2	0.2	3.2	1.8	2.3	1.8	-	81.6	7.8

le 3 Density of Infaunal Species for each 0.25 m2 Dredge Sample in Humboldt Harbor and Black Point, Sand Point, Alaska

	HUMBOLDT HARBOR SAMPLING STATIONS 1	2	3	4	5	6	7	8	9	10	NUMBER OF INDIVIDUALS	PERCENT OF TOTAL NUMBER	BLACK POINT SAMPLING STATIONS 1	2	3	4	5	6	7	8	9	10	TOTAL NUMBER OF INDIVIDUALS	PERCENT OF TOTAL NUMBER
idomus giganteus	-	5	1	2	1	7	-	4	20	4	44	6.1	17	14	32	11	2	2	6	4	1	8	97	33.2
oma spp.	14	58	10	30	33	78	9	173	72	68	545	74.9	2	2	9	50	9	4	54	5	10	-	145	49.6
tothaca staminea	-	3	1	2	1	-	-	1	4	8	20	2.7	7	2	8	3	-	5	-	2	-	-	27	9.2
truncata	-	1	2	-	5	4	-	5	2	-	19	2.6	3	6	-	-	1	-	-	-	2	-	12	4.1
culus spp.	-	-	1	-	-	1	-	20	2	2	26	3.6	-	-	-	-	-	-	1	-	-	-	1	0.3
ida spp.	-	-	-	-	3	-	-	10	-	-	13	1.8	-	-	2	-	-	-	-	-	1	-	3	1.0
nocardium nuttallii	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	1	-	-	3	-	-	-	4	1.3
arte spp.	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	1	-	-	-	-	-	-	1	1.0
chis caupo	23	-	10	-	-	-	21	5	-	1	60	8.2	-	-	-	-	2	-	-	-	-	-	2	0.7

TABLE 1. DATE, TIME, WATER DEPTH, AND SUBSTRATE TYPE
AT EACH INFAUNAL DREDGE SAMPLE SITE, SAND POINT, ALASKA

STATION	DATE	TIME	WATER[1] DEPTH(ft.)	SUBSTRATE TYPE[2]
HUMBOLDT HARBOR (Alternative A)				
1	5/2/84	1120	15	Silt/Mud over cobble-flat bottom, Pycnopodia, Clam siphons
2	5/1/84	0950	11	Silt/Mud over cobble-sloping bottom, Polychaetes
3	5/2/84	1100	17	Silt/Mud over cobble-flat bottom, Polychaetes, loose Laminaria
4	5/1/84	1010	17	Silt/Mud over bedrock-flat bottom, Polychaetes
5	4/30/84	1045	23	Silt/Mud-flat bottom, Polychaetes
6	5/1/84	1140	20	Silt/Mud-flat bottom, Polychaetes, loose Laminaria
7	5/2/84	0945	18	Silt/Mud-flat bottom, Polychaetes
8	5/1/84	1115	27	Silt/Mud-flat bottom, Polychaetes
9	5/1/84	1200	21	Silt/Mud-flat bottom, Polychaetes, loose Laminaria
10	5/2/84	1015	8	Silt/Mud over gravel-sloping bottom, Saxidomus shells, Pycnopodia,
BLACK POINT (Alternatives B and C"				
1	4/30/84	1130	15	Silt/Mud over gravel-flat bottom, Saxidomus shells.
2	4/30/84	1555	45	Silt/Mud-sloping bottom, Metridium, Pycnopodia
3	4/30/84	1420	33	Sand/Mud-sloping bottom, Laminaria, Metridium
4	4/30/84	1030	18	Silt/Mud over gravel-Laminaria, "Otter Digs", Pycnopodia
5	4/30/84	1000	22	Silt/Mud-flat bottom, clams siphons, loose Laminaria,"Otter Di
6	4/29/84	1725	7	Sand/Gravel-sloping bottom, numerous Saxidomus shells
7	4/30/84	0925	22	Silt/Mud-flat bottom, numerous Saxidomus shells, "Otter Digs"
8	4/29/84	1635	17	Sand/Cobble-flat bottom, numerous Saxidomus shells, "Otter Dig
9	4/29/84	1600	29	Silt/Mud-flat bottom, scattered Laminaria
10	4/29/84	1100	35	Silt/Mud-flat bottom, Polychaetes, Pycnopodia, Pagurus

[1] Water depth at time of SCUBA dive.
[2] Qualitative visual observation by diver

(66% of all biomass). Conversely, the dominant infaunal organism (in terms of biomass) at Black Point was Saxidomus giganteus (67.8% of all biomass). Urechis represented over 15% of the biomass estimate in Humboldt Harbor (43.4 g/m^2). Overall, the biomass estimate at Black Point was 46.5% greater than at Humboldt Harbor.

The mean polychaete biomass for Humboldt Harbor was 18.8 g/m^2. The mean polychaete biomass estimate at Black Point was 32.6 g/m^2. The polychaete biomass estimate at Black Point was 73.4% greater than at Humboldt Harbor.

Infaunal Density

The number of individuals by species for each sample site for Humboldt Harbor and Black Point is listed in Table 3. A total of 1,019 individual organisms (excluding individual polychaetes) were collected during the study, 94% of which were bivalves. The mean number of individuals (density) in Humboldt Harbor was 290.8 individuals/m^2. The mean density of individuals in Black Point was 116.8 individuals/m^2. The density of individual bivalves in Humboldt Harbor was 266.8 individuals/m^2. The dominant bivalve was Macoma spp., which constituted 81.7% (218 individuals/m^2) of all bivalves sampled in the harbor. The mean number of individual bivalves sampled at Black Point was 115.6 individuals/m^2. Macoma spp. was also the numerically dominant bivalve at Black Point, comprising 50% (58 individuals/m^2) of all bivalves sampled. Overall, the composite mean density (all organisms) at Humboldt Harbor was 149% greater than at Black Point.

STATISTICAL SIGNIFICANCE

Data collected were subjected to the Mann-Whitney U Test (Siegel, 1956), a non-parametric test which assumes that the variability of the sample populations is not equal. The hypothesis tested is that if "a" is one observation from population "A", and "b" is one observation from population "B", and the probability that a score from "A" is larger than a score from "B" is greater than one-half [p(a b) 1/2], then the "bulk" of population "A" is higher than the "bulk" of population "B" (distribution has shifted).

Infaunal Biomass

Application of the Mann-Whitney U test revealed that there is a statistically significant difference (at significance level $p = .05$) in the biomass measurements for the bivalves Saxidomus giganteus and Macoma spp. in the two populations sampled. The biomass of Saxidomus at Black Point (284 g/m^2) tested significantly higher than inside Humboldt Harbor (10 g/m^2). Conversely, the biomass of Macoma spp. in Humboldt Harbor (165 g/m^2) tested significantly higher than at Black Point (38 g/m^2). No other biomass measurements in the sampled populations tested significantly different.

Infaunal Density

A statistically significant difference (p=.05) in the density of *Macoma* spp. between the sampled populations was found. The density measurement of *Macoma* spp. in Humboldt Harbor (218 individuals/m^2) tested significantly higher than at Black Point (58 individuals/m^2). No other density measurements in the sampled populations tested significantly different.

HUMBOLDT HARBOR BREAKWATER RECOLONIZATION

Methods

Subtidal transects were conducted on the basin side of the north breakwater of Humboldt Harbor in an attempt to document epifaunal recolonization after a period of 10 years. Divers collected all attached organisms within a 0.125 m^2 quadrat at three locations along each transect: water's edge at time of dive, midway between the water's edge and toe of the breakwater, and at the toe of the breakwater. The samples were fixed in formalin in the field and washed through a 3 mm^2 screen in the laboratory. Specimens were identified, enumerated, and the composite whole-wet-weight of all individuals (except algae) of each species in the sample was determined to the nearest 0.1 gram with a Sauter K-1200 balance.

Results

Table 4 lists the biomass of epifaunal species for each 0.125 m^2 breakwater sample. Subtidal profiles of each transect can be found in Appendix A . Ten epifaunal species were collected from the breakwater samples. The mean composite biomass estimate was 311.4 g/m^2. The dominant organism (in terms of biomass) was the tubeworm *Serpula vermicularis*, comprising 65% of the composite biomass estimate at 201 g/m^2. *Balanus* spp. comprised 31% of the composite biomass estimate at 96.4 g/m^2. All other epifaunal organisms sampled totaled only 4% of the mean composite biomass estimate.

TABLE 4. Biomass of Epifaunal Species in Grams for each 0.125m^2 Sample from the North Breakwater of Humboldt Harbor, Sand Point, Alaska. May 5, 1984.[1/]

TRANSECT #1			
DISTANCE	DEPTH	BIOTA	WEIGHT
0	0	Scattered *Fucus furcatus*, *Ulva*,	--
		Balanus glandula and *B. cariosus*	99.1
		Littorina sitkana	0.3
7	-4	*Alaria* spp. to -3 meters	--
		Serpula vermicularis	71.9
		Cancer oregonensis	1.8
13	-8	Scattered *Laminaria saccharina*, *Agarum cribrosum*	--
		Serpula vermicularis	35.9
		Puncturella cucullata	1.7
		Chlamys rubida	6.9
		Margarites pupillus	0.1
TRANSECT #2			
0	0	Sparse *Fucus furcatus*	--
		Balanus glandula	29.4
12	-5	Dense *Laminaria saccharina*, scattered *Agarum cribosum*	--
		Serpula vermicularis	55.5
		Margarites pupillus	2.4
15	-10	Scattered *Laminaria saccharina*	--
		Serpula vermicularis	104.7
		Terebratalia transversa	4.9
		Trichotropis cancellata	0.6

1/Distance and depth measured in meters

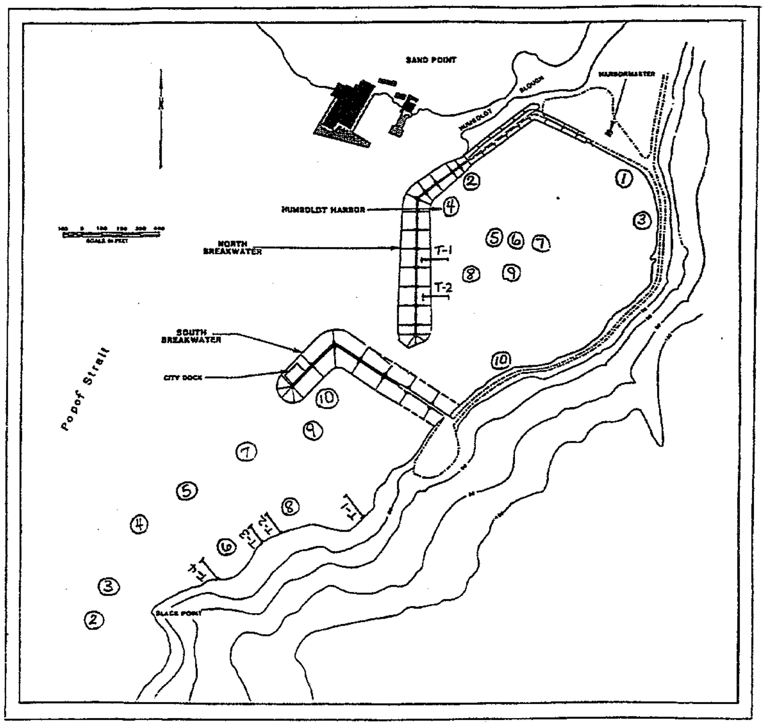


FIGURE 1. Location of Dredged Sample Stations and Intertidal and Breakwater Transects at Humboldt Harbor and Black Point. Sand Point, Alaska.

② dredged sample station

transect location

Literature Cited

Abbott, R.T. 1968. A Guide in Field Identification, Seashells of North America. Golden Press, Racine, Wisconsin. 280 pp.

Barr, L, and N. Under Alaskan Seas, The Shallow Water Marine Invertebrates. Alaska Northwest Publishing Co., Anchorage, Alaska. 208 pp.

Brett, C.E. 1964. A Portable Hydraulic Diver-operated Dredge-sieve for Sampling Subtidal Macrofauna. J. Mar. Res. 22: 205-207.

Morris, P.A. 1966. A Field Guide to Shells of the Pacific Coast and Hawaii. Houghton Mifflin Co., Boston, Mass. 297 pp.

Siegel, S. 1956. Nonparametric Statistics for the Behavioral Sciences. McGraw - Hill Book Co. New York. 153 pp.

Kozloff, E.M. 1974. Keys to the Marine Invertebrates of Puget Sound, the San Juan Archipelago, and Adjacent Regions. University of Washington Press, Seattle, Washington. 226 pp.

APPENDIX B

SUBTIDAL TRANSECTS
BLACK POINT, ALASKA

Benthic Survey of Small Boat Harbor Site
Sand Point, Alaska
June, 1997

Introduction

Benthic surveys were conducted at Sand Point, Alaska by U.S. Fish and Wildlife Service (Service) divers/biologists to assess a site being proposed by the U.S. Army Corps of Engineers (COE) for construction of a small boat harbor. Alternative sites have been reviewed by the COE and a preferred site chosen. Therefore, this reconnaissance-level profile of near-shore aquatic habitats will assist the Service in providing mitigation suggestions to the COE.

Methods/Results

Two dive sites were selected based upon a previous benthic survey conducted by the Service in 1985. In 1985, Service biologists dove three transects within the area delineated by the city dock retaining wall (Figure 1). For this survey we approximated the locations of the two 1985 dive sites inside Black Point (T1 and T2), and repeated dives at those locations (Figure 1).

At each site, a 100-meter tape measure was laid out perpendicular to the shore along the bottom, beginning at the water line. Direction of Transect 1 was 100^0 and direction of Transect 2 was 60^0 to 70m and 100^0 to 100m along the tape. During the survey, a diver proceeded along the transect tape, working seaward from shore, and stopping to record information at stations spaced in 10 meter intervals along the tape. Data were recorded using a standard format printed on waterproof paper.

Water depth and substrate type were recorded at each station. Water depths were later adjusted to compensate for the tide level at the time of the survey. The reference datum used is mean lower low water (MLLW) from the National Oceanic and Atmospheric Administration (1996). Substrates, other than bedrock, were identified based on particle size (millimeters), and categorized as boulder (>256), cobble (256-64), pebble (64-4), sand (2-0.06), and silt (<0.06). Figure 2 graphically depicts the bottom contour and substrate composition at each transect site.

As a general description of the habitat along each transect, prominent plant and animal species observed within a 2-meter radius of the station center were recorded (Table 1). A video recording was filmed along each transect using an 8 mm video recorder with water-tight housing.

Additionally, Service and COE biologists traveled the coastline approximately 80 m offshore in the City of Sand Point's fire boat. Video recordings and photographs were made of the shoreline from Mud Bay, south to the old cannery (Figure 3). Two original alternative sites were included in the recording; Mud Bay and Popov Cove.

Conclusions/Recommendations

Four distinct subtidal habitat types occur within the proposed harbor area. 1) shallow sand flat dominated by eel grass (*Zostera marina*) beds; 2) nearshore rocky areas dominated by brown algaes 3)cobble/gravel substrates with abundant attached marine invertebrates and red algaes and 4)deeper sand/mud substrate (Ferrell, 1985).

A small eelgrass bed occurred on Transect #1(T1) between 50 and 70 meters and no eel grass was found on Transect #2 (T2). A denser eel grass bed was found within the proposed harbor area, but it was to the north of T1 (Figure 1). Brown algaes including wing (Alaria spp), seersucker (Costaria costata) and sugar (Laminaria spp.) kelps were dominant vegetation in the rocky areas of both transects. Less obvious red and green kelps were scattered throughout both transects: These included cracked saucer (*Constantinea subulifera*), graceful coral seaweed (*Coralina vancouverensis*), red rock crust (*Lithothamnium* spp.), and two species of sea lettuce (*Ulva fenestrata/obscura*). Black pine (*Neorhodomeia larix*) occurred on T1 only.

Attached in the nearshore rocky substrates were a variety of marine gastropods including limpets (*Acmaea mitra, Notoacmaea* spp.), snails, (*Lacuna carinata, Margarites pupillus, Natica clausa*) and periwinkles (*Littorina sikana*). Bivalves inhabiting the nearshore areas include blue mussels (*Mytilus edulis*), heart cockles (*Clinocardium nuttallii*), soft-shelled clams (*Mya arenaria*), rock jingles (*Pododesmus cepio*), littleneck clams (*Protothaca staminea*) and butter clams (*Saxidomus gigantus*). Although no sea otters were observed, clam shells indicative of otter predation were found in both transects.

Other marine invertebrates inhabiting the project site include barnacles (*Balanus* spp.), crabs (Class Arthropoda), sea cucumbers (*Cucumaria miniata*), jellyfish (*Aequorea/Aurelia*), nudibranchs (*Triopha/Hermissenda*), polycheates (*Serpula vermicularis*) and sea stars (Class Asteroidea). Anemones (*Metridium/Tealia*), small green urchins (*Strongylocentrotus droebachiensis*) and sponges (*Halichondria panicea*) were observed in T2 . Off transect but within the project area another clam species, *Humilaria kennerlyi*, and a mollusc known as a sea angel (*Clione kincaidi*) were found. Observations of were unusual because sea angels usually swim in schools far out at sea, only rarely coming in close to shore.

Numerous fish species were found on both Transects (Table 1). The rocky substrates of the nearshore environment provides breeding areas for several species of rockfish. Territorial defensive behavior was observed from several individual fish on T2.

Alternative Sites

We began shoreline observations from the City of Sand Point's fireboat at Mud Bay (Figure 3). This bay was the most physically and vegetatively distinct area we surveyed. We entered Mud Bay approximately two hours past low tide. Unlike the rocky substrate which dominated the rest of the coast, Mud Bay appeared to have primarily a sand/mud bottom. The entire bay was covered in eelgrass. Birds using Mud Bay included Black-Legged Kittiwakes, Mew Gulls and other large gull species. Sea otters were seen just west of the entrance of Mud Bay.

The second alternative site we visited was Popov Cove. A rocky substrate predominated in the cove, and this area was most similar in vegetation to dive site T2 (within the proposed harbor). *Laminaria* sp. was the dominant vegetation in the cove, with patchy distribution of zelgrass and 5-ribbed kelp. Witches hair (Desmerestia sp.) grew close to the eastern shore. Intertidal dominants included barnacles, mussels and fucus.

The last site we visted was Sand Point Spit. The vegetation dominating this shallow cove was *Laminaria* spp.

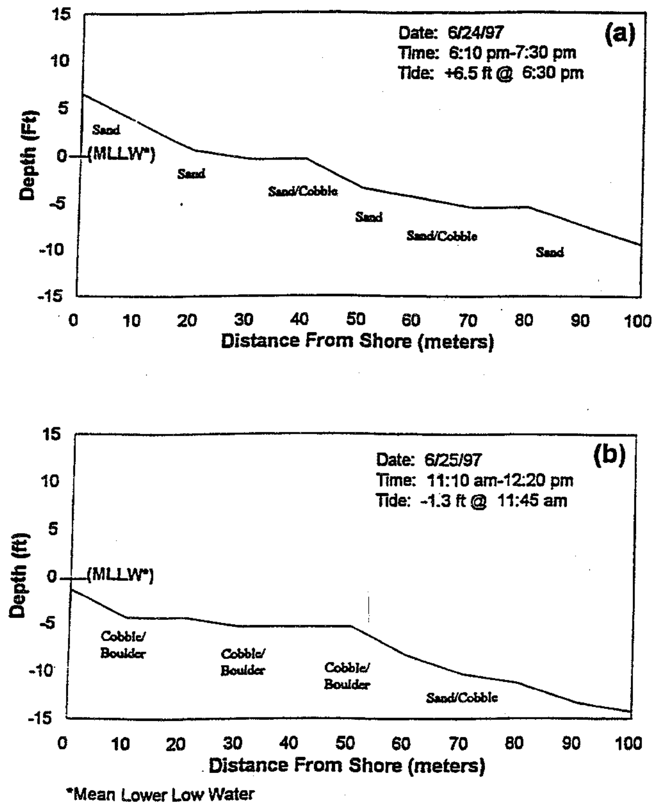


Figure 2. Bottom Profiles for Two Transects Within the Preferred Small Boat Harbor Site, Sand Point, Alaska: June, 1997. (a) Transect #1 (b) Transect #2

APPENDIX C

U.S. FISH AND WILDLIFE SERVICE MITIGATION POLICY

Fish and Wildlife Service Mitigation Policy Synopsis.

Under the Fish and Wildlife Coordination Act and the National Environmental Policy Act, the Fish and Wildlife Service (Service) has responsibilities to ensure that project-related losses to fish and wildlife resources are identified and mitigated. As part of our participation in project planning, a mitigation plan should be developed in accordance with the Service Mitigation Policy (FR Vol. 46, No. 15, January 23, 1981) and in consultation with the Environmental Protection Agency and alaska Department of Environmental Conservation. The plan would provide guidance for evaluating and mitigating impacts of the proposed project to fish and wildlife.

A mitigation plan is developed by first selecting fish and wildlife habitats from among the full range of habitats occurring within the area to be impacted by both direct as well as indirect impacts. These are chosen either because they represent resources which are most characteristic of the area or because the Fish and Wildlife Service has mandated responsibilities for them. By narrowing the scope in this way, the analysis can focus on areas where significant changes are most likely to occur and not be unduly burdened by inclusion of areas with low wildlife value.

After identifying important habitats, evaluation species, which function as indicators of habitat quality and quantity, are chosen, Selection of evaluation species has an important role in determining the extent and type of mitigation achieved. A combination of two sets of criteria is typically used to choose species for this purpose. The first is to pick species with high pubic interest, subsistence, or economic values while the second is to select species which utilize habitats having significant ecological values.

Fish and wildlife habitats are then assigned to one of the four Resource Categories delineated in the Service Mitigation Policy (Table A-1). Designation of habitat into Resource Categories ensures that the level of mitigation recommended is consistent with the value of the habitat and its relative abundance on an ecoregion or national basis.

The determination of the relative scarcity or abundance of the evaluation species' habitat from the national perspective is based on 1) the historic range and habitat quality, and 2) the current status of that habitat. A significant reduction in either the extent or quality of habitat for an evaluation species indicates that it is scarce or becoming scarce, while maintenance of historical quantity and quality is the basis for considering it abundant.

For all Resource Category 1 habitat, the Service will recommend that all losses of existing habitat be prevented, as these one-of-a-kind areas cannot be replaced. Insignificant changes that do not result in adverse impacts on habitat value may be acceptable provided they will have no significant cumulative impact.

Specific ways to achieve the mitigation goal for Resource Category 2 when loss of habitat value is unavoidable include 1) physical modification of replacement habitat to convert it to the same type which was lost, 2) restoration of rehabilitation of previously altered habitat, 3) increased management of similar replacement habitat so that in-kind value of lost habitat is replaced, or 4) a combination of these measures. By replacing habitat value losses with similar habitat values, populations of species associated with that habitat may remain relatively stable in the area over time.

The mitigation goal of in-kind replacement of lost habitat, however, cannot always be achieved. When opposition to a project on this basis alone is not warranted, deviation from this goal may be appropriate. Two such instances occur when either different habitats and species available for replacement are determined to be of greater value than those lost, or when in-kind replacement is not physically or biologically attainable in the ecoregion. In either case, replacement involving different habitat kinds may be recommended, provided that the total value of lost habitat is compensated.

For Resource Category 3, in-kind replacement of lost habitat is preferred though not always possible. substituting different habitats, or increasing management of different habitats so that the value of the lost habitat is replaced,1 may be ways of achieving the planning goal of no net loss of habitat value.

For Resource Category 4, the Service will recommend ways to avoid impacts or to immediately rectify them or to reduce or eliminate them over time. If losses remain likely to occur, then the Service may make a recommendation for compensation, depending on the significance of the potential loss. However, because these areas possess relatively low habitat values, they will likely exhibit the greatest potential for significant habitat value improvements. Service personnel will fully investigate these areas' potential for improvement, since they could be used to mitigate Resource Category 2 and 3 losses.

Table 1. Species Observed During Benthic Dive Survey, Sand Point, Alaska: June 24-25, 1997

Species	Transect #1	Transect #2
PHYLUM ANTHOPHYTA (seagrasses)		
Zostera marina (eelgrass)	X	
PHYLUM PHAEOPHYTA (brown kelp)		
Agarum fimbriatum (shotgun kelp)	X	X
Alaria sp. (kelp)	X	X
Costaria costata (5-rib, seersucker kelp)	X	X
Desmarestia sp. (acid kelp, witches hair)	X	X
Desmarestia viridis (acid kelp)	X	
Fucus furcatus (popweed, rockweed)	X	X
Laminaria bongardiana (elephant ear kelp)	X	X
L. saccharina (sugar or 1-ribbed kelp)	X	X
Melanosiphon intestinalis (dark sea tube)	X	X
PHYLUM RHODOPHYTA (red algae)		
Constantinea subulifera (cracked saucer)	X	X
Corallina vancouveriensis (graceful coral seaweed)	X	X
Lithothamnium sp. (red (pink) rock crust)	X	X
Neorhodomela larix (black pine)	X	
PHYLUM CHLOROPHYTA (green algae)		
Ulva fenestrata (sea lettuce)	X	X
Ulva obscura (dark sea lettuce)	X	X
PHYLUM PORIFERA (sponges)		
Halichondria panicea (crumb of bread)		X
PHYLUM CNIDARIA		
Class Scyphozoa/Hydrozoa (jellyfish)		
Aequorea sp.(water jelly)		X
Aurelia labilata (moon jelly)	X	
Class Anthozoa (anemone/seapen/ whip)		
Metridium senile (plumose anemone)		X
Tealia crassicornis (christmas anemone)		X
PHYLUM CTENOPHORA (comb jelly)		X

Species	Transect #1	Transect #2
Class Polychaete		
Serpula vermicularis (calcareous tubeworm)	X	X
PHYLUM MOLLUSCA		
Class Amphineura (chitons)		
Tonicella sp. (Pink) (lined or tiger chiton)	X	X
Class Gastropoda (snails and limpets)		
Acmaea mitra (dunce cap limpet)	X	X
Lacuna carinata (snail)		X
Littorina sitkana (sitka periwinkle)	X	X
Margarites pupillus (puppet margarite snail)	X	X
Natica clausa (moon snail)	X	
Notoacmaea sp. (plate limpet)	X	X
Searlesia dira	X	X
Class Bivalvia (clams)		
Clinocardium nuttallii (heart cockle)	X	X
Mya arenaria (soft shelled clam)	X	X
Mytilus edulis (blue mussel)	X	X
Pododesmus cepio (rock jingle)		X
Protothaca staminea (littleneck/steamer clam)	X	X
Saxidomus giganteus (butter clam)	X	X
Class Nudibranchia (sea slugs)		
Triopha catalinae (orange-tipped nudibr)		X
Hermissenda crassicornis (opalescent nudibr)	X	
Class Arthropoda		
Balanus glandula (acorn barnacle)	X	X
Balanus cariosus (thatched barnacle)	X	X
Elassochirus sp. (hermit crab)	X	X
Pagurus sp. (hermit crab)	X	X
Telmessus cheiragonus (helmet crab)	X	X
PHYLUM ECHNOIDERMATA		
Class Holothuroidea (sea cucumbers)		
Cucumaria miniata (red sea cucumber)	X	X
Class Echinoidea (sand dollars/urchins)		
Strongylocentrotus droebachiensis (green urchin)		X

Species	Transect #1	Transect #2
Class Asteroidea (sea stars)		
Evasterias troschelii (mottled star)		X
Henricia leviuscula (blood star)		X
Pycnopodia helianthoides (sunflower star)	X	X
Solaster dawsonii (sun star)		X
PHLYUM CHORDATA		
Class Pisces (fish)		
Citharichthys sordidus (Pacific sanddab)	X	X
Cottidae (sculpins)	X	
Hexagrammus hemilepidotus (red Irish lord)	X	X
H. lagocephalus (rock greenling)		
Lepidopsetta bilineata (rock sole)	X	X
Sebastes auriculatus (brown rockfish)		X
S. caurinus (copper rockfish)	X	

APPENDIX D

AGENCY COMMENTS
DRAFT FWCA REPORT

Laurie
Gary

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 898
ANCHORAGE, ALASKA 99506-0898

REPLY TO ATTENTION OF:

Environmental Resources Section

SEP 2 3 1997

Ms. Ann Rappoport
U.S. Fish and Wildlife Service
Ecological Services Anchorage
605 West 4th Avenue, Room 62
Anchorage, Alaska 99501-2249

Dear Ms. Rappoport:

After review of the August 1997 Draft Fish and Wildlife Coordination Act Report: Sand Point Harbor Project, we submit the following comments.

1. Page 1, Summary -- Area of impact is 19 acres for alternative 1, and 21 acres for alternative 2.

2. Page 5, Table 1 - For Mud Bay, the shallow depths would necessitate substantial dredging. Use of Mud Bay would not necessarily result in a 40-acre impact. A harbor built at this location would most likely be 23 acres. Under Popof Bay, change shall to shallow. For Sand Point Spit, real estate issues are also a major concern.

3. Page 6, Alternative 1 - The south breakwater would be extended 570 feet to the southwest and a 730-foot breakwater would extend from shore northeast. The design would accommodate approximately 30 vessels. The total footprint is 19 acres, including dredging approximately 8 acres and constructing a 2.9-acre storage/access area. Dredged material would be placed along the shore of the proposed harbor to construct the storage/access area, along the shoreline of the existing harbor at a previously permitted location, and in the northwest corner of the new basin at depths in excess of -20 feet MLLW. There would no need to discharge materials at the airport.

4. Page 6, Alternative 2 - The total foot print for this alternative would be 21 acres and would accommodate 5 more vessels than alternative 1.

5. Page 9, Marine Resources - Should clarify that information on the substrate in the harbor, including sea otter digs, was conducted in 1984 at the existing harbor. To our knowledge, sea otter digs were not observed in 1997, just broken shells indicative of their feeding. In the second paragraph of this section, Black Point is much more diverse in habitat and aquatic species than what area?

6. Page 10, Fish - Please provide a reference citing for the quote "ADF&G has identified the nearshore waters of Black Point as most valuable to rearing salmon moving along the coastline." What is meant by "most valuable?"

7. Page 10, Project Impacts, Alternative 1 - Area of impact should be 19 acres. Please clarify the meaning/intent of the statement "If breakwater construction occurs over a long period of time, sediments settling over undisturbed marine vegetation could inhibit growth and smother benthic invertebrates." Sedimentation from breakwater construction is primarily dependent upon the amount of fines in the materials being discharged; not necessarily the length of time it takes to construct the structure.

8. Pages 12 - 14, Mitigation - We recognize the Service's mitigation policy; however, the transition from discussions on the site's habitat value to the need for compensatory mitigation should be expounded upon. What are the anticipated project specific effects from construction of the proposed harbor improvements on the evaluation species? Is the site considered to be critical or essential habitat for these species? Is the project going to have more than a negligible effect on fish and wildlife populations in the Sand Point area? If so, what will be the effect? How will the mitigation proposed compensate for the potential impacts?

9. Blasting of rock is expected to be necessary in order to dredge the basin and entrance channel. Information on timing windows and other mitigative measures would be helpful.

If you have any questions or need additional information, please contact Mr. Bill Abadie at 753-2736. Please provide a final Fish and Wildlife Coordination Act Report prior to October 31, 1997.

Sincerely,

Guy R. McConnell

Guy R. McConnell
Chief, Environmental Resources Section

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL	# of pages ▶ 1
To Laurie	From Barbara
Dept./Agency	Phone #
Fax # 9/22/97	Fax #
NSN 7540-01-317-7368 5099-101	GENERAL SERVICES ADMINISTRATION

TED STATES DEPARTMENT OF COMMERCE
onal Oceanic and Atmospheric Administration
onal Marine Fisheries Service
W. 7th Avenue, #43
orage, Alaska 99513-7577

ptember 22, 1997

Ann Rappoport, Supervisor Ecological Services
U.S. Fish and Wildlife Service
Anchorage Field Office
605 W. 4th Avenue, Room G62
Anchorage, AK 99501

Re: Draft Fish & Wildlife Coordination Act
Report: Sand Point Harbor Project

Attn: Ms. Laurie Fairchild

Dear Mrs. Rappoport,

The National Marine Fisheries Service (NMFS) has completed its review of the above referenced project report. NMFS feels that the Sand Point Harbor Project Alternative 1 offers the least impacts to the fishery resources of the area, lessens direct, secondary, and cumulative impacts to the marine environment, and serves the needs to the city for a harbor. NMFS agrees with recommendations 1-5 listed on page 13 of your report, with one exception. After an intergovernmental meeting with agency representatives, NMFS feels that item 2 is not needed and should not be included in the final copy. In addition, NMFS offers the following suggestion for mitigation: the establishment of a refuge, used oil, plastic, and net debris collection area in or near the harbor facility. Also, NMFS concurs that a new road should not be built from the existing quarry site located on the bench just above the harbor site. NMFS feels that the alterative to build and maintain a new road from this quarry site already exists; current city paved road.

Please contact Mr. Matthew P. Eagleton at (907) 271-6379 if there are any questions or additional information is needed.

Sincerely,

Barbara A. Mahoney

Barbara A. Mahoney
Acting Supervisor
Western Alaska Field Office
Protective Resources Management Division

APPENDIX A

HYDRAULIC DESIGN

HARBOR IMPROVEMENTS
SAND POINT, ALASKA

CONTENTS

Figures

Tables

FILENAME: appahyd.doc – January 16, 1998

HARBOR IMPROVEMENTS
SAND POINT, ALASKA

APPENDIX A
HYDRAULIC DESIGN

1. INTRODUCTION

1.1 Appendix Purpose

This hydraulic design appendix describes the technical aspects of the Sand Point harbor improvements project. It provides the background for determining the Federal interest in the major construction features including breakwater construction, dredging, and operation and maintenance.

1.2 Project Purpose

The following objectives were identified for the Sand Point harbor improvements project prior to initiating the engineering analysis.

a. Provide additional moorage for larger vessels than those for which the existing harbor was designed, due to increased demand.

b. Maintain the existing harbor's current configuration and capacity for the original design fleet.

c. Relieve congestion and reduce damages to vessels in the existing harbor.

The project purpose is to provide a safe and efficient harbor in an environmentally and economically sound manner which satisfies the above objectives.

1.3 General

The U.S. Army Corps of Engineers constructed Humboldt Harbor at Sand Point in 1976. See figure 2, main report. The harbor consists of a 16.6-acre mooring area protected by two rubblemound breakwaters. The main breakwater is 1,025 feet long with a crest elevation of +15 ft MLLW. This breakwater is connected to a 1,200-foot-long diversion dike that extends along the northwest side of the harbor to prevent fresh Humboldt Slough water from entering the harbor. A second breakwater on the south side of the harbor, 740 feet long, has a crest elevation of +13 ft MLLW. In 1982, the city constructed a 62-by-200-foot dock on an extension of the south breakwater with a depth of 35 feet at the dock face. The entrance channel is 120 feet wide and approximately 1,200 feet long, with a depth of 18 feet at MLLW.
Sand Point has developed all the usable area in its existing harbor. Due to increased usage by larger vessels, harbor users have experienced damages, excessive vessel overcrowding, and delays in operation.

The city of Sand Point, in conjunction with the Aleutians East Borough, asked the Corps to conduct a feasibility study of harbor improvements. Additional demand for moorage by larger vessels was identified as a critical issue facing the community.

2. CLIMATOLOGY, METEOROLOGY, HYDROLOGY

2.1 Climatology

Sand Point is located on Popof Island, the second most westerly of the islands in the Shumagin Group. In a maritime climatic zone, the community is situated at latitude 55°20' N. and longitude 160°30' W. off the coast of the Alaska Peninsula, as illustrated in figure 1, main report. The highest point in the Sand Point vicinity, 2 miles southeast of the town, is 1,074 feet in elevation. The nearest island and largest of the Shumagins, Unga, lies about 1 mile west of Sand Point. Its highest mountain peak rises to 2,019 feet. Across Unga Strait, 12 miles to the north, lies the mountainous Alaska Peninsula.

Due to the nearness of extensive open ocean area, temperature extremes, both seasonal and diurnal, are generally confined to narrow limits. Differences between maximum and minimum average temperatures for all individual months are less than 11 °F. Air overlying the frozen ocean surface of the Bering Sea and moving across the narrow Alaska Peninsula brings continental characteristics to the Sand Point area in winter. However, below-freezing readings are rare. The moderating effects of the large ocean areas make it difficult to define the seasonal periods at Sand Point. August is the midsummer period, and autumn arrives in October. The greatest frequency of fog usually comes in the summer season, with the foggy period extending from the middle of July to the middle of September. Table A-1 lists the average daily high and low temperatures and the recorded extreme high and low by month.

Cloudiness is prevalent, and Sand Point experiences measurable precipitation 60 percent of the time annually. The maximum total monthly rainfall is 23 inches. Snowfall is generally light, averaging approximately 40 inches per year. The maximum recorded daily snowfall is 9 inches. Table A-2 shows the summarized recorded precipitation.

Strong winds develop occasionally along the lee slope of the surrounding mountain peaks. They are most frequent and strongest along the southern peninsula slopes across Unga Strait, on the western slopes of Unga Island. These strong "williwaw" winds are usually preceded by an advancing low-pressure system with strong winds in the middle and upper troposphere. As the upper-level system approaches the mountain range, the pressure at low levels in the lee begins to fall, and a trough of low pressure forms over the lowlands. At the time when the upper-level system crosses the range, strong downward slope winds are set up between the divide and the low-pressure trough. Williwaws are intensified if there is ascending motion with precipitation on the windward side of the surrounding mountains. The high frequency of cyclonic storms crossing the North Pacific is the dominant factor at Sand Point. Wind gust speeds of 70 miles per hour or more have been recorded at Sand Point from southwest to northwest. The average windspeed year-round is about 13 miles per hour.

TABLE A-1.—*Summary of temperatures at Sand Point, Alaska*

Month	Average (°F)			Extreme (°F)			
	Daily high	Daily low	For month	Record high	Year	Record low	Year
Jan	35.1	27.2	31.1	45	1942	1	1947
Feb	35.8	26.9	31.3	48	1947	2	1947
Mar	34.1	24.2	29.1	48	1942	2	1947
Apr	40.4	30.6	35.5	53	1945	14	1945
May	45.7	35.8	46.7	64	1942	19	1947
Jun	51.6	41.3	46.4	62	1945	31	1946
Jul	56.5	45.9	51.2	76	1946	33	1945
Aug	55.9	47.7	51.8	64	1945	32	1946
Sep	53.0	43.7	48.4	61	1946	30	1946
Oct	47.7	38.8	43.2	58	1941	24	1945
Nov	38.9	30.1	34.5	49	1945	10	1941
Dec	36.2	27.5	31.8	47	1941	10	1945
Annual	44.2	35.0	39.6	76	1946	1	1947

Source: Corps of Engineers, 1986.

2.2 Tides and Water Levels

Tide levels at Sand Point, referenced to mean lower low water (MLLW), are shown in table A-3. Extreme high tide levels result from the combination of astronomic tides and rises in local water levels due to atmospheric and wave conditions.

TABLE A-2.—*Summary of precipitation at Sand Point, Alaska*

Month	Rain (inches)			Snow (inches)		
	Mean	Daily max.	Year	Mean	Daily max.	Year
Jan	4.70	1.22	1946	7.6	6.0	1946
Feb	5.82	1.26	1947	9.4	4.0	1947
Mar	2.76	1.08	1946	9.7	6.0	1945
Apr	4.33	1.10	1946	5.3	9.0	1947
May	5.75	1.61	1947	0.2	0.8	1947
Jun	3.64	1.03	1942	0.0	0.0	
Jul	2.05	1.13	1946	0.0	0.0	
Aug	7.61	3.38	1946	0.0	0.0	
Sep	4.28	1.29	1946	0.0	0.0	
Oct	8.37	1.56	1946	—	—	—
Nov	4.99	2.69	1946	6.2	6.4	1945
Dec	6.00	1.72	1945	2.1	2.3	1944
Annual	60.30	3.38	1946	40.5	9.0	1947

Source: Corps of Engineers, 1986.

TABLE A-3.—*Tidal data, Sand Point, Alaska*

Tide	Elevation (ft MLLW)
Observed Extreme High Water*	+11.4
Mean Higher High Water	+7.3
Mean High Water	+6.6
Mean Tide	+6.6
Mean Low Water	+1.4
Mean Lower Low Water	0.0 (datum)
Observed Extreme Low Water**	-3.6

* December 31, 1986.
** February 5, 1985.
Source: NOAA National Ocean Service 1994).

2.3 Currents

According to *Tidal Current Tables 1997, Pacific Coast of North America and Asia* (NOAA 1997), the currents in Popof Strait, adjacent to the proposed harbor improvements area, have an average maximum flood velocity of 0.2 knots and an average maximum ebb velocity of 0.5 knots.

2.4 Ice Conditions

The ice pack in the Bering Sea occasionally moves south of the Pribilof Islands and surrounds them during periods of prolonged north and northeast winds. However, it does not reach the Sand Point area or any other areas south of the Aleutian Islands. Local icing conditions are experienced in the existing Sand Point harbor basin during extremely cold winters when the prevailing wind is from the north to northwest. Ice thicknesses of 3 to 4 inches are reported, with the longest duration less than a week. Such conditions do not shut down the harbor, however, since the ice is weak and porous. Sea ice is generally not present in Sand Point, but occasionally salt-water ice can form during extremely cold winters. It is typically of a very short duration due to the frequency of warmer low-pressure storm systems that melt the ice.

2.5 Wind Data

Wind data recorded from 1967 to 1970 at Sand Point were used to develop a frequency curve for three durations by Pearson Type III statistics. Figure A-1 presents the frequency curve developed from this data and used in the 1973 General Design Memorandum (GDM) for the Humboldt Harbor project at Sand Point. In the GDM, the design wind for a recurrence interval of 50 years was determined to be 77 miles per hour for a ½-hour duration. An Expanded Reconnaissance Report done for Sand Point in 1983 by the Corps of Engineers' Alaska District cited the 1973 GDM. The 1967-70 wind data was also used to conduct a wind analysis for the 1995 Reconnaissance Report for Boat Harbor Improvements at Sand Point. Design wind velocities for a ½-hour duration were determined to be 77 miles per hour for wind directions from west-southwest to west, and 82 miles per hour for wind directions from west-northwest to north-northwest. The 1995 report also determined that the prevailing wind direction is from the northwest, with an average occurrence of 21.3 percent annually. Interviews with local residents confirmed that the predominant winds come from the north to northwest. A distribution of wind direction occurrence using the 1967-70 recorded data is illustrated in figure A-2.

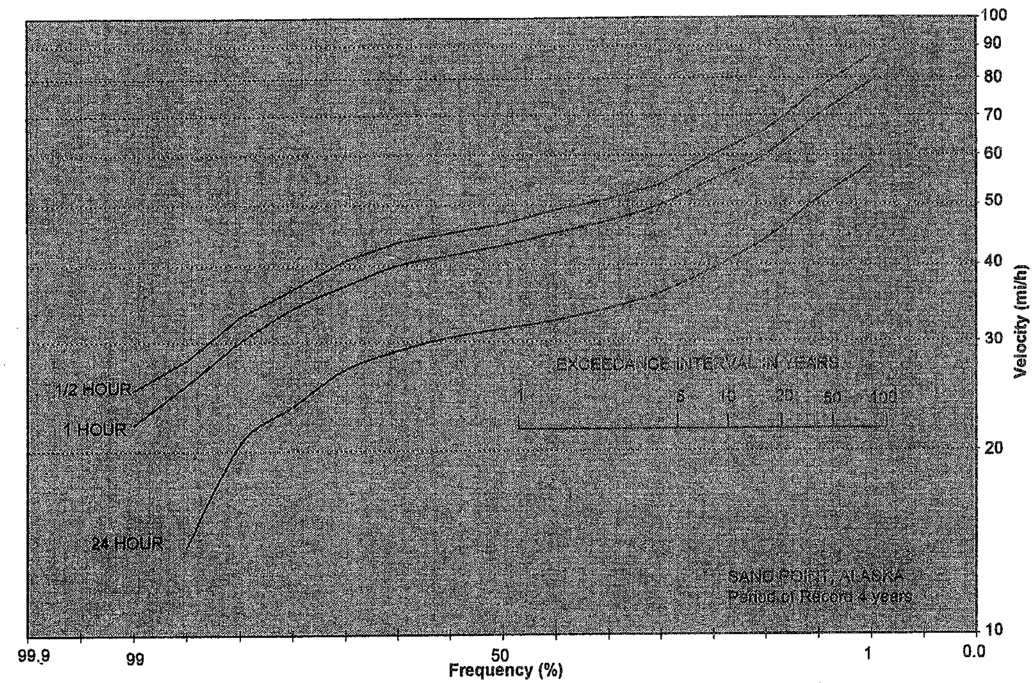


Figure A-1.--Extreme wind predictions (1973 GDM).

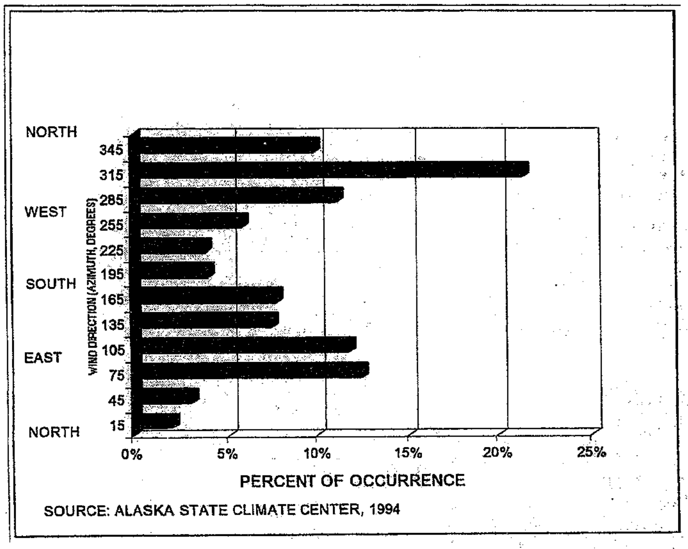


FIGURE A-2.--Distribution of wind direction.

3. WAVE STUDIES

3.1 Wave Exposure

The proposed project area in Sand Point is protected from deep-water waves approaching between the southwest and north-northwest sectors by Unga Island, bounded approximately by azimuths 220° and 350° relative to true north. Deep-water waves approaching from the north-northeast to the southwest are sheltered by Popof Island. The proposed harbor site is exposed to waves from the north generated across approximately 8 miles of fetch and affected by shoaling and gap refraction when they enter northern Popof Strait. The existing harbor is naturally protected to some extent from the northern wave. Fetch distances across Popof Strait to the proposed harbor site range from 1.5 miles to 3.23 miles. Therefore, the design wave for the proposed project is based on the relatively short fetch from the west-southwest, but must take into account the refracted wave from the north when considering harbor configuration. Figure A-3 shows wave exposure windows affecting the project site.

3.2 Deep-Water Waves

Measured wave height data is not available for Sand Point. However, previous studies have predicted maximum wave heights of 6.8 feet based on wind data records. The following general statements appear applicable to the deep-water wave climate in the vicinity of the proposed Sand Point harbor site:

a. Wave heights of 4 to 6 feet are the maximum observed by longtime local residents.

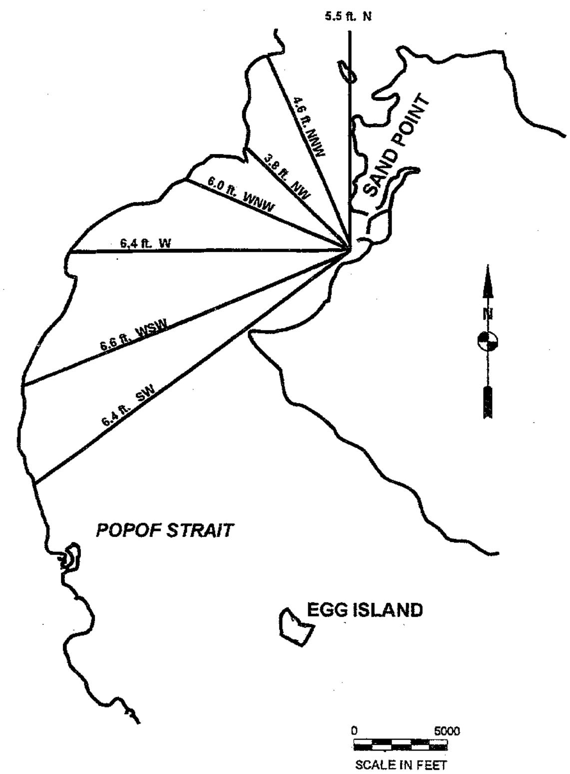
b. "Typical" wave periods range from about 3 to 6 seconds.

c. Local residents and recorded data indicate waves from the north to northwest are predominant.

d. Long-period swells from the open ocean do not impact the study area.

3.3 Limiting Conditions

The city dock at the end of the existing south breakwater is located in water 35 feet deep at MLLW. The proposed breakwater extending from the end of the existing breakwater would be constructed in depths ranging from 35 feet to 20 feet at MLLW. These depths do not limit the maximum wave height possible at the proposed breakwater. The available fetch for wave generation is the limiting factor for wave height. Table A-4 shows the effective fetch for the various directions affecting the proposed harbor site.



NOTE: DESIGN WAVE HEIGHTS CALCULATED FROM ST WAVE SIGNIFICANT WAVE RESULTS.

ALASKA DISTRICT CORPS OF ENGINEERS CIVIL WORKS BRANCH	**WAVE EXPOSURE** SAND POINT HARBOR IMPROVEMENTS	**A-3**

TABLE A-4.—*Fetch distances*

Direction	Effective fetch distance (mi)
WSW	3.2
W	2.4
WNW	1.8
NW	1.5
NNW	2.1
N	4.5

Note: Effective fetch calculated as prescribed in 1984 SPM

3.4 Design Wave (1973 General Design Memorandum)

To determine the design wave height and period, a statistical analysis of the available wind data was performed for the 1973 General Design Memorandum (GDM) using Pearson Type III statistics. The maximum 1/2-hour-duration windspeed of 77.0 miles per hour (mi/h) from the southwest was used. A frequency curve for wind data obtained was given in figure A-1.

The design wave for the 1973 harbor design was determined by applying the design windspeed to the effective fetch of 2.7 miles from the southwest. The resulting breakwater design wave was a 6.2-foot non-breaking wave. The 6.2-foot wave did not generate inner harbor waves in excess of the allowable design criterion of 1 foot.

Accounts from local residents and the harbormaster indicate that the design waves determined above are representative of conditions observed in the area. Longtime local observers report that the maximum wave heights observed in Sand Point are "4.5 to 6 feet" during the worst storms. Also, observed wave heights in the entrance channel and mooring area during storms verify the design wave heights used in the 1973 GDM. The harbormaster at Sand Point reports no problems due to wave heights in the existing harbor. Waves in the existing harbor are about 1 foot in height.

3.5 New Design Wave (1997 Study)

Wind data from previous reports for this project and for the existing Humboldt Harbor at Sand Point were reevaluated for this study. Design wind, duration, direction, wave height, and wave period from previous reports are shown in table A-5. The maximum 1/2-hour-duration windspeed of 77 mi/h and the maximum 1-hour-duration windspeed of 70 mi/h from the west-southwest were verified and used as the basis for wave height calculations. This is considered conservative since the period of record is relatively short. Comparisons to wind data from Cold Bay showed, in general, a correlation between wind velocities there and at Sand Point. However, considerable

TABLE A-5.—*Previous design wind, wave, and period*

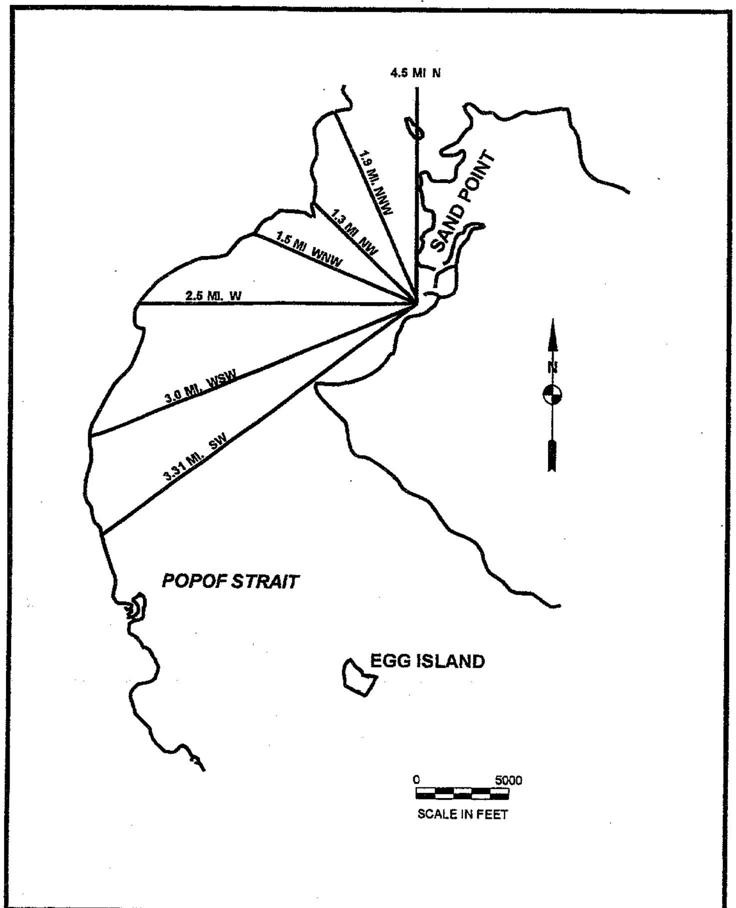
Previous reports	Design wind (mi/h)	Duratio n (hr)	Direction	Design wave* (ft)	Wave period (sec)
Humboldt Harbor (1970)	88	0.5	SW	6.7	4.6
Humboldt Harbor expansion GDM (1974)	77	0.5	SW-WSW	6.2	4.4
Sand Point Recon. Report (1983)	76	0.5	SW-WSW	6.8	4.0
Draft Sand Point Detailed Project Report (1986)	74		WSW	6.5	3.3
Sand Point Recon. Report (1995)	77	0.5	WSW	7.2	3.6

* Reports varied in use of H_s to H_1.

variability was evident due to localized conditions, and local residents have reported that wind conditions can vary significantly between the two communities at the same time. Local residents also stated that the predominant wind is from the north to northwest. This wind was not considered in previous reports because of the existing harbor's natural protection from that direction.

Using the fetch distances shown in table A-4, maximum wave generation for the available fetch was estimated. Figure A-4 shows the direction of the design fetches. An analysis based on guidance in Engineer Manual (EM) 1110-2-1414 was performed to calculate the significant wave height and period. Table A-6 shows the calculated results of wave height and period for the various wind directions. Using an angle of wave approach to bottom contours of 60 degrees for the west-southwest wave, and applying methods given in the *Shore Protection Manual* (SPM), a refraction coefficient of 0.96 was derived. Applying this coefficient to the wave height of 6.7 feet results in a design wave height of 6.4 feet with a period of 4.1 seconds. Local residents have observed waves in the 3-to-4-foot range, with occasional 6-foot waves seen near the project site.

Using the STWAVE computer model, wave heights were analyzed for the range of directions to which the proposed site is exposed. The design windspeed of 77 mi/h was modified for stability correction and location effects to derive an 85mi/h adjusted windspeed for the various directions of exposure. Grids were prepared from NOAA chart data to reflect the bathymetry and geometry of the Popof Strait area, taking into account a still water level of +11.5 ft MLLW. Results indicated a significant wave height of 5.2 feet with a period of 3.9 seconds at the harbor area for a wave coming from the west-southwest. Table A-7 gives the result from the STWAVE model. A sensitivity analysis was performed by varying the windspeed from 50 to 100 mi/h, which produced a variance of 1 foot higher and lower wave.



	ALASKA DISTRICT CORPS OF ENGINEERS CIVIL WORKS BRANCH	**FETCH DISTANCE AND DIRECTION** SAND POINT HARBOR IMPROVEMENTS	**A-4**

TABLE A-6.—*Deep-water wave forecasting**

Elevation of data collection (ft)			33	$U_{33} = (33/z)^{1/7} U_z$				
Stability correction R_T			1.1	(fig. 5-28 in EM*)				
Location effects R			1	(fig. 5-27 in EM*)				
Direction	Fetch (mi) F	Design wind (mi/h) U	Windspeed (mi/h) U_c	Duration (hr) t	Duration required for fetch limited t_f (hr)	H_s (ft)	T_p (s)	Condition
WSW	3.23	77	85	0.5	0.68	6.2	4.5	Duration limited
NNW	2.11	77	85	0.5	0.51	6.2	4.5	Duration limited
W	2.44	77	85	0.5	0.56	6.2	4.5	Duration limited
WNW	1.78	77	85	0.5	0.46	5.6	3.5	Fetch limited
NW	1.5	77	85	0.5	0.41	5.1	3.3	Fetch limited
N	4.5	77	85	0.5	0.85	6.2	4.5	Duration limited
WSW	3.23	70	77	1	0.71	6.7	4.1	Fetch limited
NNW	2.11	70	77	1	0.53	5.4	3.6	Fetch limited
W	2.44	70	77	1	0.58	5.8	3.7	Fetch limited
WNW	1.78	70	77	1	0.47	4.9	3.4	Fetch limited
NW	1.5	70	77	1	0.42	4.5	3.2	Fetch limited
N	4.5	70	77	1	0.88	7.9	4.6	Fetch limited

*Equations from table 5-3, EM 1110-2-1414 (7 Jul 1989).

TABLE A-7.--*STWAVE results (using 77 mile-per-hour windspeed)*

Fetch direction	Significant wave (ft)	Design wave (H_{10}) (ft)	Wave period (s)
N	4.3	5.5	6.1
NNW	3.6	4.6	4.0
NW	3.0	3.8	3.0
WNW	4.7	6.0	3.9
W	5.0	6.4	3.9
WSW	5.2	6.6	3.9
SW	5.0	6.4	3.9

Based on the above analyses, information, previous reports, and observations, a design wave height of 6.6 feet (which corresponds to the 10-percent wave height from the STWAVE analysis) and a period of 3.9 seconds were selected for use in this study. This wave would be a fetch-limited, non-breaking wave for a design still water level of +11.5 ft MLLW. Under certain tide and wave direction conditions, depths for wave breaking to occur were investigated using SPM methods. Using an offshore slope of 1V:10H with the design wave calculated above, a breaking wave would occur in water depths of approximately 8.8 feet. A portion of the proposed breakwater structure would lie at this depth. A breaking wave stability coefficient was applied for the armor stone design for breakwater sections that would be located at this depth for the range of tides at Sand Point.

4. EXISTING HARBOR AND THE AUTHORIZED PROJECT

4.1 General Description

Humboldt Harbor at Sand Point, constructed in 1976, consists of a north breakwater approximately 1,500 feet long, a south breakwater approximately 1,000 feet long, and an entrance channel 18 feet deep at MLLW. The breakwaters enclose a 16-acre mooring basin. The mooring basin contains a float system designed for 148 slips to accommodate vessels up to 65 feet in length, and 1,400 feet of floating dock to which transient boats can side-tie. The harbor has a servicing dock with a 42-by-105-foot working area. To load and offload containers and cargo, the city widened and extended the south breakwater and constructed a 62-by-200-foot dock on the seaward side of the breakwater in a water depth of 30 feet at MLLW. A plan view of the harbor is shown in figure 2, main report.

4.2 1976 Construction

4.2.1 Entrance Channel.

The 120-foot-wide entrance channel makes a 60-degree turn at the head of the rock groin breakwater on a radius of approximately 200 feet. The channel width was based on the degree of wave protection needed in the basin. However, the 120-foot width could allow two-way passage of vessels with beams in the 20-to-25-foot range. The 18-foot design depth was based on a vessel draft of 14 feet at the extreme low tide of -3.0 ft MLLW, and 1 foot of bottom clearance.

4.2.2 Harbor Basin Layout.

Moorage facilities consist of a concrete float system with four main floats. Two main floats and one side of a third float have slips to accommodate 140 vessels of various lengths up to 65 feet. The third float can also accommodate from 7 to 10 larger vessels depending on their lengths. The fourth float, 260 feet long, is used for transient vessels. Six steel-and-timber-pile dolphins at the edge of the harbor are used by larger floating processors and commercial barges.

4.2.3 Breakwaters.

Alignment and Length. The first 850 feet of the north breakwater, aligned northeast to southwest, serves as a diversion dike to prevent fresh water from entering the harbor from the slough to the north. The remaining 650 feet of the breakwater runs due south to the entrance channel. The south breakwater extends northwest from shore approximately 700 feet and serves as the southern edge of the entrance channel.

The breakwater then runs southwest approximately 300 feet, with the city dock along its seaward side.

Height. The height of the diversion dike portion of the northern breakwater is generally +12 to +13 ft MLLW, increasing to +15 ft along the west side of the harbor. The side slopes are 1V:2H on both sides of the diversion dike and on the harbor side of the remainder of the northern breakwater and the southern breakwater. The basin sides of both breakwaters have side slopes of 1V:1.5H. The southern breakwater was designed for a crest height of +13 ft MLLW.

Underlayer Design. A two-layer system was used for construction of the breakwaters. The armor layer consists of a 4-foot thickness of armor stone with a maximum stone weight of 4,000 lb. At least 50 percent of the stones in this layer weigh more than 1,300 lb. The underlying armor stone, or secondary stone, has an average weight of 130 lb and a maximum weight of 500 lb in a 2-foot layer. The core material consists of quarry spalls.

Toe Design. The primary armor cover layer extends to -13 ft MLLW on the seaward sides and head sections of the breakwaters. The armor extends to -3.5 ft MLLW on the harbor sides of the breakwaters. A 10-foot toe consisting of core material in a 2-foot layer supports the secondary layer where it rests on the ground.

Armor Stone. Armor stone for the main trunk of the breakwater is 4,000 lb maximum, 1,000 lb minimum at a thickness of 4 feet. The armor layer is at least two stones thick.

4.3 1982 Construction (Non-Federal Project)

A causeway leading to a deep-water dock that incorporated the existing south breakwater was designed by a consultant for the city of Sand Point. Construction was completed in 1982. The structure consists of a widened south breakwater to provide access to a 62-by-200-foot dock built on the seaward side. The additional rock used to construct the causeway appears to be smaller and is suffering damage due to wave conditions. The causeway and dock, built to elevation +13 ft MLLW, have experienced some overtopping due to wave runup. During a site visit in March 1997, holes were noticed in the surface of the causeway where it interfaces with the concrete dock. There was also evidence of loss of materials at the head of the causeway breakwater. The slab foundation for the building on the end of the causeway has been affected by settling. Materials supporting the slab have been displaced.

5. HARBOR DESIGN CRITERIA

5.1 Design Vessel and Design Fleet (1973 GDM)

The 1973 economic analysis was based on a resident fleet of 83 fishing vessels and an additional 123 transient fishing vessels that based a portion of their operations out of Humboldt Harbor. Vessel sizes from the economic analysis varied between skiffs, seiners, and tenders, ranging in length from 28 to 125 feet. The entrance channel was designed to allow two-way traffic for vessels with beams of 20 to 25 feet. The entrance channel was dredged to allow all-tide passage for vessels with drafts up to 14 feet.

According to the economic analysis, the plan called for a 230-vessel basin to allow expansion of the then-present 120-vessel fleet. This plan took into account the expansion anticipated while maximizing the net benefits for the project.

5.2 Allowable Wave Height in the Entrance Channel (1973 GDM)

A diffraction analysis at the entrance channel recommended lengthening the north breakwater proposed in a previous report to reduce the harbor wave height to 1.1 feet adjacent to the entrance channel and 0.4 foot within the basin. Such wave heights would not interfere with ingress and egress in the entrance channel and harbor basin.

The entrance channel depth was established in the 1973 GDM based on the following criteria:

a. Vessel draft of up to 14 feet.

b. Access at all tide stages (lowest estimated tide -3 ft MLLW).

c. Bottom clearance of 1 foot.

This combination resulted in an entrance channel depth of -18 ft MLLW. The natural depth off the shoreline varied, reaching depths as great as -35 ft MLLW at the proposed harbor entrance.

5.3 Allowable Wave Height in the Moorage Area

Maximum allowable wave heights in the mooring areas within the proposed harbor improvements would be limited to 1 foot. This criterion is outlined in EM 1110-2-1615, "Hydraulic Design of Small Boat Harbors" (USACE 1984).

The 1973 Humboldt Harbor design borders on the definition for a "small-craft" harbor. Since the design fleet consisted mainly of vessels smaller than 100 feet, the design wave in the harbor or at the floats was limited to 1 foot to satisfy the safe harbor criteria. The wave heights that would occur in the harbor were analyzed and determined to be significantly less than the 1-foot maximum allowed.

Diffraction analyses were used to calculate the wave heights expected with each harbor alternative investigated for this study. The 1-foot wave height criterion was adhered to for each alternative considered.

5.4 New Design Vessel and Fleet (1997 Study)

Additional capacity for approximately 37 vessels was identified as an objective for this study. The number and lengths of these vessels are given in table A-8. Lengths, beams, and unloaded drafts for the fleet were developed in conjunction with the harbormaster and various harbor users. These vessels unload their product at the processor dock outside the harbor before they enter. Therefore, unloaded drafts were used to calculate required depths for the entrance channel and mooring basin.

TABLE A-8.—*Design fleet (additional vessels)*

Length (ft)	**Number**
80-130	32
131-150	5

Currently, a portion of the new design fleet, including vessels near the maximum length and beam, are using the existing harbor and severely overcrowding the float system in the basin. Several of the largest vessels are tying up at the five three-pile mooring dolphins adjacent to the northern breakwater. These mooring dolphins require the use of a skiff for shore access.

The design vessel for this study is 150 feet in length with a beam of 34 feet and an unloaded draft of 11.5 feet.

5.5 Entrance Channel

The proposed entrance channel depth was determined based on the criteria below.

a. Design vessel unloaded draft = 11.5 feet.

b. Pitch, roll, and heave, based on 2/3 of the significant wave height in the channel = 2.7 feet.

c. Safety clearance (based on rocky bottom) = 3 feet.

d. Squat = 0.6 feet.

e. Tide allowance.

Considering the frequency of various low tide levels, an analysis was performed to predict the percentage of access available for different tides for the entrance channel depths. Table A-9 shows the percentage of time that the tide stage would be exceeded and the corresponding design channel depth using the above criteria.

TABLE A-9.–*Low tide exceedance and corresponding design entrance channel depth*

Design channel depth (ft MLLW)	Tide elevation (ft MLLW)	% of time/yr tide is lower
-21.5	-3.6	0%
-20.5	-2.5	0.3%
-19.5	-1.5	2%
-18.5	-0.5	5%
-18	0	7%
-17.5	0.5	9%
-16.5	1.5	25%
-15.5	2.5	26%
-13.5	4.5	55%

The combination of these criteria results in an entrance channel depth of -21.5 ft MLLW. This depth represents 100-percent access to the harbor. Using the above criteria with a low tide value of 0 ft MLLW results in an entrance channel depth of –18 ft MLLW. At this depth, the tide level would not diminish the allowances for vessel motion and safety clearance 93 percent of the time. The existing harbor at Sand Point has an entrance channel design depth of –18 ft MLLW. Therefore, an entrance channel shallower than –18 ft MLLW for the adjacent improvement is not recommended, considering the safety of vessels that would be using both harbors. Natural bottom elevations offshore from the end of the proposed entrance channel are at -30 ft MLLW. The proposed channel would be dredged to -18 ft MLLW. Dredging would end at a point approximately delineated by a line connecting the ends of the proposed breakwaters. It is assumed that vessels using the harbor would guide themselves without tug assistance through the entrance channel and into the harbor.

Channel width was determined by criteria given in EM 1110-2-1613 (USACE 1994). For a one-way ship channel with 0.5-to-1.5-knot currents, the width should be approximately 3.5 times the beam of the design vessel, giving 120 feet of channel bottom width. For the proposed entrance channel, a minimum bottom width of 120 feet with additional width in the channel turn increasing to 230 feet (1.5 × design vessel length) would allow for adequate maneuverability and clearance on either side of the breakwaters. Side slopes of 1V:3H would be used and would be armored in areas exposed to wave action.

A dredged harbor basin inside the breakwater is required for vessel turning and docking for the proposed design fleet. The depth for the basin is -17 ft MLLW. This is based on an 11.5-foot unloaded draft vessel, 2 feet under-keel safety clearance, and a minimum low-tide elevation of -3.6 ft MLLW. The minimum tide level of

-3.6 ft MLLW (extreme low tide) was used due to the vessel requirement to remain and maneuver in the harbor regardless of tide level. Permanent moorage of the design fleet requires that the vessels be able to stay in the harbor for the range of tides experienced at Sand Point. Extreme low tides of -3.6 ft MLLW occur several times throughout the year, and tide elevations are also influenced by atmospheric pressure conditions. The harbormaster reported that low tides approached –3.6 ft on many occasions when the predicted tides were not as extreme.

6. ALTERNATIVES CONSIDERED IN DETAIL

6.1 General

A range of sites and alternatives was considered for harbor improvements at Sand Point. These included two sites north of the existing harbor, expanding the existing harbor itself, a site adjacent to and south of the existing harbor, and a site farther south along the shoreline at Sand Point Spit near Peter Pan Seafoods' dock. All of these sites are accessible by road. Other possible sites off the road system were not considered in this study due to excessive costs and real estate requirements for providing access and infrastructure.

Physical modeling of the alternatives was beyond the time and budget constraints of this analysis. Also, given the relatively low wave climate and the performance of the existing harbor over the years, it was determined that physical modeling was not necessary for this study. The alternatives were then evaluated using established design guidance given in the appropriate EM's and the SPM.

The sites considered for Sand Point harbor improvements are described in the following paragraphs. They are illustrated in figure 4, main report.

6.1.1 Mud Bay.

Mud Bay is about 1.5 miles north of the existing harbor. The site is naturally sheltered by Range Island and two headlands. Mud Bay covers an area of about 40 acres. Natural depths average less than -6 ft MLLW. The amount of dredging required to develop this site is the main reason it was eliminated from further study. Based on a 23-acre basin and entrance channel, and a design depth of -17 ft MLLW, the required dredging quantity would be approximately 410,000 cubic yards of material. The excessive costs of dredging and disposal of the dredged materials and the lack of infrastructure near the site resulted in the elimination of this site from further consideration.

6.1.2 Popof Cove.

Popof Cove, about a mile north of the existing harbor, was also investigated as a possible site for the project. Natural depths of -20 ft MLLW at this site are acceptable for construction of a rubblemound breakwater. The average existing depth in the potential harbor basin area is less than -10 ft MLLW. Thus the site would require substantial dredging. Also, the properties surrounding the site are residential. Residents and city officials have spoken strongly against harbor development at Popof Cove. Because of the high costs of required dredging and the excessive real estate requirements for the necessary infrastructure, this site was not considered further.

6.1.3 Sand Point Spit.

The Sand Point Spit site is approximately 1-1/4 miles south of Humboldt Harbor, near the existing airport runway. This site has land available for harbor support facilities and ready access to the airstrip and road system. Investigation of existing bathymetry offshore of the spit shows a bottom elevation of -30 ft MLLW approximately 300 feet offshore. The depth then increases rapidly to about -70 ft MLLW. Development of this site for the design fleet would require an extensive breakwater with excessive quantities of materials. Real estate issues involving Peter Pan Seafoods would also be a major consideration. This site was therefore eliminated from further consideration.

6.1.4 Existing Harbor.

The existing harbor was extensively studied (USACE 1986) for accommodation of a larger fleet by reconfiguring the float system within the existing basin. The plan to increase moorage within the harbor by greater utilization of space developed into two options: (1) Expand the float system by adding new floats onto the existing floats, or (2) rearrange the entire float system. The plan to expand the existing float system was determined to be more cost-effective than complete rearrangement. This plan was then studied in detail; several layouts were presented. This study determined that expanding the float system to accommodate the then-present demand for moorage would be a local project not requiring Federal involvement.

Since that time, the demand for moorage of larger vessels has increased beyond the safe operating capacity of the existing harbor. Several alternatives were identified (USACE 1995) that required removal and replacement of the existing breakwaters to enlarge the basin to allow increased moorage of larger vessels. None of these alternatives would provide enough mooring area for the fleet and design vessel identified in this study. Therefore, expansion of the existing harbor was eliminated from further consideration.

The area adjacent to the south of the existing harbor, known as Black Point, then became the focus of study area for potential harbor expansion and improvements. To reduce construction costs as much as possible, it was desirable to develop a plan that would use the existing facilities most effectively and meet the need for additional moorage.

6.2 Alternative Plans

6.2.1 No Action.

The existing harbor would remain as it is and continue to be used at a capacity exceeding its design. Severe overcrowding in the harbor, lack of sufficient mooring space, impacts on maneuvering in the fairways and entrance channel, excessive wear and tear on the float system, and possible degradation of water quality in the harbor would occur with the no-action alternative.

6.2.2 Alternative 1.

General. With this alternative, a mooring basin would be constructed adjacent and to the south of the existing harbor. The plan incorporates the southern breakwater and causeway to the city dock by extending the existing breakwater to form a basin for mooring the design fleet. An additional breakwater would be constructed to the south of the newly formed basin to provide protection from incoming waves from the south to the west-southwest. The positioning of the breakwaters would create an entrance channel alignment allowing access from the west to northwest. A plan view of alternative 1 is in figure 5, main report.

This alternative would accommodate the fleet of larger vessels by providing slip spaces for vessels longer than 80 feet and parallel moorage capable of handling vessels in the 150-foot range. Vessels would approach the harbor through the 120-foot-wide entrance channel around the head of the new extended breakwater. Width of the channel would increase to 230 feet in the turn, allowing the vessels to negotiate it without excessive maneuvering. The harbor's accessibility would be comparable to the existing Humboldt Harbor. The entrance channel width would be about three times the beam width of the design vessel at the entrance. In the turn, the entrance channel would become 1.5 times the length of the design vessel. This is more than adequate, since the larger vessels generally are equipped with bow thrusters and are able to maneuver unassisted. The entrance channel would be used as a one-way entrance. Armoring the entrance channel side slope would be required in depths where the wave in the channel could break. A cross section of the proposed entrance channel is shown in figure 6, main report.

The entrance channel depth outside the breakwater would remain unchanged, as the natural depth ranges from -30 ft MLLW to -60 ft MLLW. The entrance channel would follow the alignment of the existing harbor entrance; however, exposure to winds and waves from the north would be increased. The design depth for the entrance channel is –18 ft MLLW.

There is little evidence of littoral drift in the proposed project area. The 1973 GDM for Humboldt Harbor anticipated minimal shoaling of the entrance channel, which has proven to be the case. Comparisons of surveys and photographs of the shoreline and field observations at Sand Point show little evidence of material being transported and deposited on the beach. It appears that maintenance dredging of the entrance channel and new harbor basin would be minimal during the 50-year project life. Some maintenance dredging may be required, depending on storm conditions over the years, but this would be very infrequent if necessary at all. A maintenance dredging operation at Humboldt Harbor in 1993 yielded only 817 cubic yards of material for a 17-year period.

Harbor Basin. The new harbor basin would be dredged to -17 ft MLLW. This is based on a vessel with an unloaded draft of 11.5 feet, 2 feet for safety clearance, and a minimum low-tide elevation of -3.6 ft MLLW. A total combined harbor basin and maneuvering area of approximately 8.6 acres would be required for alternative 1.

Wave Height Criteria and Harbor Operation Plan. In the 1973 Humboldt Harbor GDM, the existing harbor configuration was analyzed with respect to wave refraction into the entrance channel. A maximum wave height of 1.1 ft just inside the basin was calculated to be expected during the design wave conditions outside the harbor. Progressively smaller wave heights would occur farther into the harbor mooring areas. The existing harbor therefore was designed to meet the 1-foot wave criteria along the floats inside the harbor. The proposed plan with alternative 1 would have the same wave height conditions in the entrance channel as in the existing harbor entrance since it would use a basically identical alignment and configuration. The new harbor entrance would be more exposed to waves from the north than the existing harbor. A wave diffraction analysis was performed using the computer model STWAVE. The results were compared to results from methods prescribed in the SPM to confirm the validity of STWAVE's estimations. The highest wave heights in the basin were generated from the west-northwest direction. The STWAVE results are shown in figure A-5. Results indicated that the maximum wave height in the closest mooring area to the entrance channel would be less than the 1-foot criterion. The breakwaters were positioned taking into account the estimated waves from all directions of exposure. Additional wave energy dissipation would be provided by the natural shore slope on the inside of the proposed southern breakwater on the shore side of the entrance channel turn. Therefore, wave height criteria for the floats would be met for the new expanded basin and entrance channel.

Circulation. Circulation in the existing harbor is driven primarily by the tidal prism in the basin. Strong winds drive surface water currents within the harbor and contribute to mixing in the water column. Wave action is an insignificant factor in driving circulation in the harbor. Water sampling data suggest that harbor-generated pollutants have not significantly affected the present water quality in the harbor.

Tides would cause most of the circulation in the new harbor south of the existing harbor. An exchange coefficient of 0.26 was calculated based on the difference in volume of water in the proposed basin between MHHW and MLLW compared to the volume at MHHW. Values greater than 0.20 have been cited as providing good circulation. The aspect ratio for alternative 1 is approximately 2:1. This is considered close to optimum.

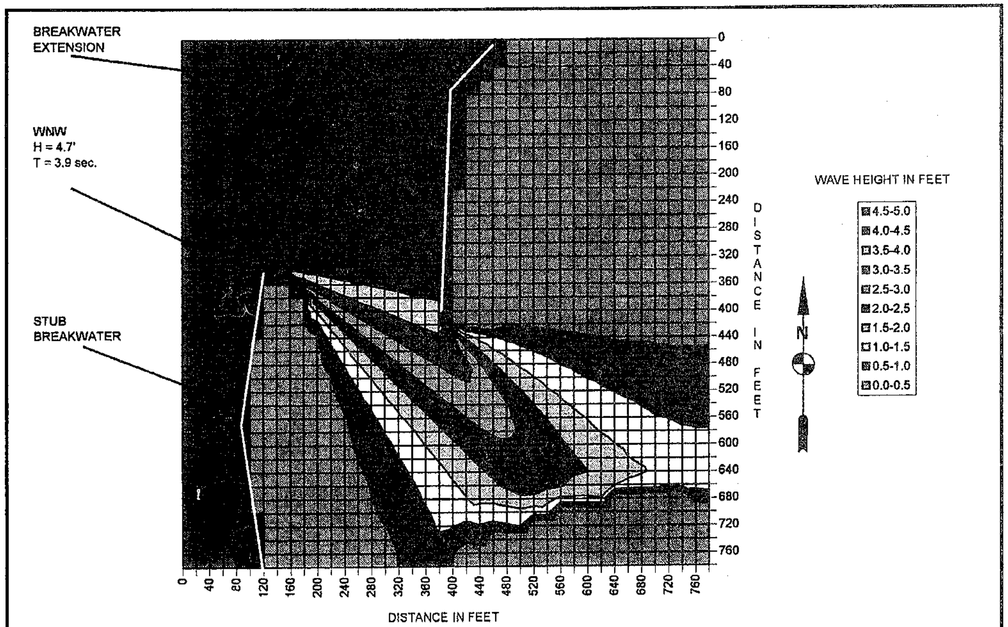
Shoaling. Visual observations, condition surveys, and historical accounts of conditions at the existing harbor indicate that shoaling does not occur in the entrance channel. Similar conditions can be expected to occur at the proposed site. Tidal flushing and lack of a significant sediment source would keep the entrance channel free from shoaling.

Construction Dredging. Initial construction dredging quantities were derived from the May 1997 Corps of Engineers survey and a geophysical survey performed in July 1997 (Golder Associates 1997). Initial construction would involve dredging and possible blasting of material consisting of rock, sands and gravels, and cobbles to the project limits. A total of 47,800 cubic yards (yd^3) of dredging would be required for the entrance channel and maneuvering area of alternative 1, and 31,000 yd^3 would be required for the mooring area. Dredged materials would be placed along the shore of the basin to create uplands for parking and harbor operations. Additional dredged material would be disposed of at the spoil pit, designated for dredged material disposal, at the existing harbor. Any additional disposal could occur in the greater depths of the newly constructed basin, if needed.

Work inside the harbor could be accomplished with a large clamshell dredge, since sand and gravel would be encountered during construction. However, an excavator could be utilized for harder material if necessary. According to Golder Associates (1997), there are areas of dredging where bedrock may require blasting. Dredging equipment and methods would be left as an option for the contractor.

Side slopes for the basin would be dredged to 1V:3H. The slopes would not require armor protection except for the area in the turn of the entrance channel that would be exposed to breaking wave conditions.

Maintenance Dredging. Based on historical information on conditions in the existing harbor, the project would present few sedimentation problems. Project condition surveys are performed every 4 years at the existing harbor. A maintenance dredging operation at Humboldt Harbor in 1993 yielded only 817 cubic yards of material for a 17-year period. Indications are that littoral transport of sediments along the beach outside the harbor is very minor. Also, sediment transport from tidal flushing of the lagoon does not contribute any appreciable amount of sediment to the area. Minimal maintenance dredging is therefore anticipated in the project maneuvering basin and entrance channel. It is estimated that project condition surveys would be performed every 4 years, and 1,000 cubic yards of material would have to be removed every 18 years.



ALASKA DISTRICT
CORPS OF ENGINEERS
CIVIL WORKS BRANCH

STWAVE INNER HARBOR WAVE RESULTS - ALTERNATIVE 1

SAND POINT HARBOR IMPROVEMENTS

A-5

Breakwaters. A 570-foot-long rubblemound breakwater would be extended from the south breakwater of the existing harbor to form the northwest side of the harbor and the eastern side of the entrance channel. Maximum depths of water are -30 ft to -35 ft MLLW along the alignment of the breakwater. A 730-foot-long breakwater would be constructed from shore and extend northwest to a depth of approximately -15 ft MLLW, where it would change to a north-south alignment to form the western side of the entrance channel. Foundation materials are sand, gravel, and cobbles, which would serve as a suitable base for the rubblemound structure.

Methods described in the SPM using Hudson's equation were used to determine stone sizes. Using 1V:1.5H side slopes, K_d values of 3.2 for quarry stone on the structure head with a non-breaking wave, 2.0 for quarry stone on the structure trunk with a breaking wave, and the wave height determined in section 3, stone sizes were determined. Armor stone with a range of sizes from 3,200 lb maximum to 1,900 lb minimum would be used on the sea-side face. Secondary stone would range from 1,900 lb maximum to 200 lb minimum. Core material would be 200 lb maximum to 1 lb minimum. Armor stone thickness would be 5.0 feet, and secondary rock thickness would be 2.5 feet. Typical breakwater sections are shown in figure A-6.

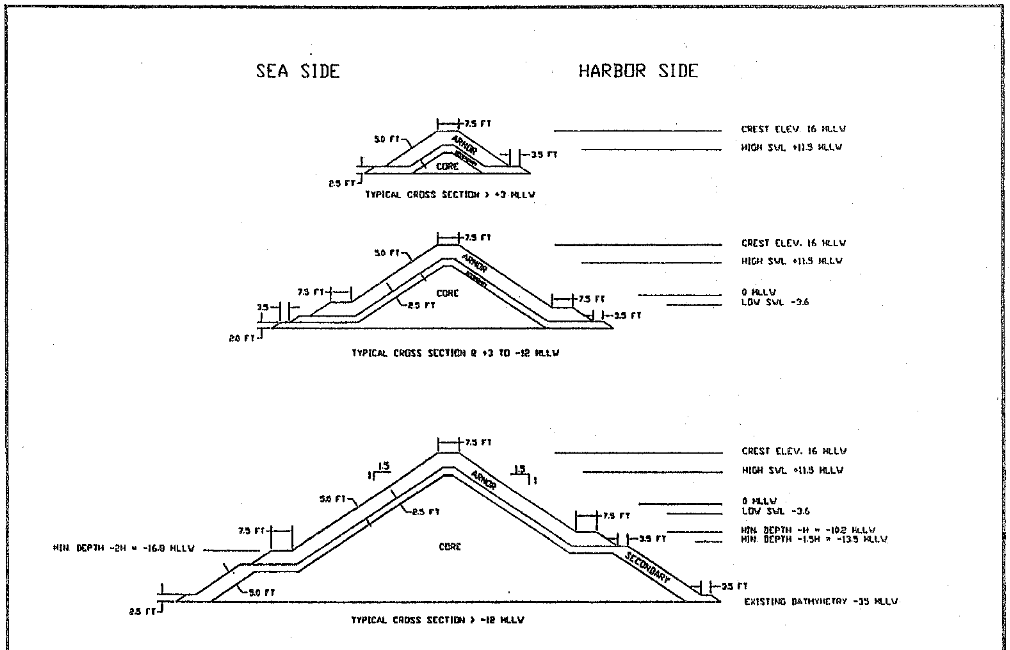
A wave runup calculation was performed to determine the crest elevation of the breakwater. During the design storm wave conditions, 4.5 feet of wave runup would result on the face of the breakwater. Using a design still water level of +11.5 ft MLLW, a crest elevation of +16 ft MLLW was selected. A crest width of 7.5 feet was calculated based on the armor size. A +16-ft-MLLW crest elevation also provides increased constructability for the breakwaters.

A total of 29,100 cubic yards of armor rock, 21,300 cubic yards of secondary rock, and 74,100 cubic yards of core rock would be required for breakwater construction.

Dredged Material Disposal. The dredged material would be disposed of in an intertidal area adjacent to the proposed harbor. The area would provide approximately 2.7 acres of uplands by filling in subtidal areas ranging from -5 ft to +13 ft MLLW. Additional dredged material could be disposed of in the new basin in depths in excess of -20 ft MLLW. Existing bottom conditions are sand, gravel, and cobbles. A total of 78,800 yd^3 of dredged material would be deposited in the disposal areas.

6.2.3 Alternative 2.

General. As in alternative 1, this alternative would provide a mooring basin adjacent to the existing harbor, to the south. It incorporates the southern breakwater and causeway to the city dock by extending the existing breakwater to form a basin for mooring the design fleet. An additional breakwater would be constructed south of the newly formed basin to provide protection from incoming waves from the south to the west-southwest. Unlike alternative 1, the positioning of the breakwaters would



ALASKA DISTRICT CORPS OF ENGINEERS CIVIL WORKS BRANCH	TYPICAL BREAKWATER CROSS SECTIONS SAND POINT HARBOR IMPROVEMENTS	A—6'

create an entrance channel alignment allowing access from the southwest. A plan view of alternative 2 is in figure 7, main report.

This alternative would accommodate the fleet of larger vessels by providing slip spaces for vessels longer than 80 feet and parallel moorage capable of handling vessels in the 150-foot range. A 120-foot-wide entrance channel would make a direct approach with a slight turn into the harbor around the head of the new extended breakwater. This degree of turn into the entrance would be much less extreme than that of alternative 1 but would require an additional redirection of the vessel's course. The entrance channel width would be about three times the beam width of the design vessel at the entrance. The entrance channel would be used as a one-way entrance. Armoring the entrance channel side slope would be required in depths where the wave in the channel could break. A cross section of the proposed entrance channel is shown in figure 8, main report.

The entrance channel would follow a new alignment different from that of the existing harbor entrance. Exposure to winds and waves from the north would be minimized; however, exposure to the southwest would be increased. For this reason, the entrance channel outside the breakwater would be dredged to a depth of –19 ft MLLW. Natural depths vary from –10 ft to –19 ft MLLW.

Harbor Basin. The new harbor basin would be dredged to -17 ft MLLW. This is based on a vessel with an unloaded draft of 11.5 feet, 3 feet for safety clearance, and a minimum low-tide elevation of -3.6 ft MLLW. A total combined harbor basin and maneuvering area of approximately 10.1 acres would be required for alternative 2.

Wave Height Criteria and Harbor Operation Plan. The alternative 2 plan would have wave heights in the entrance channel similar to or slightly less than those in the existing harbor entrance, since it would experience somewhat different exposures. The new harbor entrance would be more exposed to wave conditions from the southwest than the existing harbor. A wave diffraction analysis was performed using the computer model STWAVE. The results were compared to results from methods prescribed in the SPM to confirm the validity of STWAVE's estimations. The highest wave heights in the basin were generated from the southwest direction. The STWAVE results are shown in figure A-7. Results indicated that the maximum wave height in the closest mooring area to the entrance channel would be less than the 1-foot criterion. The breakwaters were positioned taking into account the estimated waves from all directions of exposure. Therefore, wave height criteria for the floats would be met for the new expanded basin and entrance channel.

Circulation. Circulation in the existing harbor is driven primarily by the tidal prism in the basin. Strong winds drive surface water currents within the harbor and contribute to mixing in the water column. Wave action is an insignificant factor in driving circulation in the harbor. Water sampling data suggest that harbor-generated pollutants have not significantly affected the present water quality in the harbor.

Tides would cause most circulation in the new harbor south of the existing harbor. An exchange coefficient of 0.26 was calculated based on the difference in volume of water in the proposed basin between MHHW and MLLW compared to the volume at MHHW. Values greater than 0.20 have been cited as providing good circulation. The aspect ratio for alternative 2 is approximately 1.7 to 1.

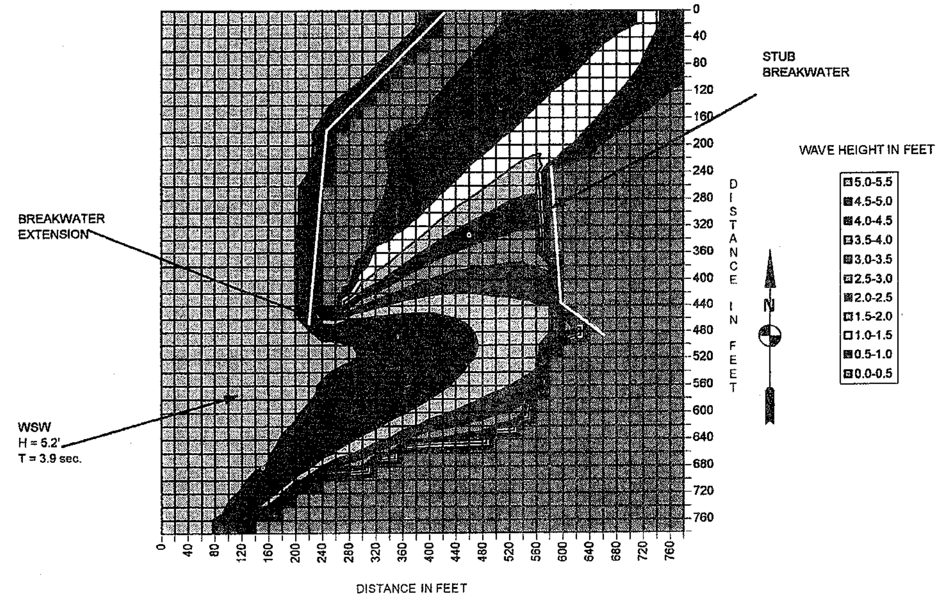
Shoaling. Visual observations, condition surveys, and historical accounts of conditions at the existing harbor indicate that shoaling does not occur in the entrance channel. Conditions exist at the proposed site for alternative 2 that could cause shoaling of the entrance channel. Armoring the shore side of the channel would minimize this potential for filling in the channel.

Construction Dredging. Initial construction dredging quantities were derived from the May 1997 Corps of Engineers survey and a geophysical survey performed in July 1997 (Golder Associates 1997). Initial construction would involve dredging material consisting of rock, sands and gravels, and cobbles to the project limits. A total of 30,200 yd^3 of dredging would be required for the entrance channel and maneuvering area of alternative 2, and 40,200 yd^3 would be required for the mooring area. Dredged materials would be placed along the shore of the basin to create uplands for parking and harbor operations. Additional dredged material would be disposed of at the spoil pit, designated for dredged material disposal, at the existing harbor. Any additional disposal could occur in the greater depths of the newly constructed basin, if needed.

Work inside the harbor could be accomplished with a large clamshell dredge, since sand and gravel would be encountered during construction. However, an excavator could be utilized for harder material if necessary. According to Golder Associates (1997), there are areas of dredging where bedrock may require blasting. Dredging equipment and methods would be left as an option for the contractor.

Side slopes for the basin would be dredged to 1V:3H. Armor protection would be required to prevent the newly dredged entrance channel from shoaling due to wave and tidal action along the beach.

Maintenance Dredging. Based on historical information on conditions in the existing harbor, the project would present few sedimentation problems. Project condition surveys are performed every 4 years at the existing harbor. A maintenance dredging operation at Humboldt Harbor in 1993 yielded only 817 cubic yards of material for a 17-year period. Indications are that littoral transport of sediments along the beach outside the harbor is very minor.



ALASKA DISTRICT CORPS OF ENGINEERS CIVIL WORKS BRANCH	**STWAVE INNER HARBOR WAVE RESULTS - ALTERNATIVE 2** SAND POINT HARBOR IMPROVEMENTS	**A-7**

There is greater potential for shoaling in the entrance channel of alternative 2 than with alternative 1, due to the shallower surrounding areas and greater exposure of the channel to wave conditions. Still, minimal maintenance dredging is anticipated in the project maneuvering basin or entrance channel. It is estimated that project condition surveys would be performed every 4 years, and that 1,900 cubic yards of material would have to be removed every 12 years.

Breakwaters. A 985-foot-long rubblemound breakwater would be extended from the south breakwater of the existing harbor to form the northwest side of the harbor and the eastern side of the entrance channel. Maximum depths of water are -30 ft to -35 ft MLLW along the alignment of the breakwater. A 370-foot-long breakwater would be constructed from shore and extend northwest to a depth of approximately -15 ft MLLW, where it would change to a north-south alignment to form the western side of the entrance channel. Foundation materials are sand, gravel, and cobbles, which would serve as a suitable base for the rubblemound structure.

Methods described in the SPM using Hudson's equation were used to determine stone sizes. Using 1V:1.5H side slopes, K_d values of 3.2 for quarry stone on the structure head with a non-breaking wave, 2.0 for quarry stone on the structure trunk with a breaking wave, and the wave height determined in section 3, stone sizes were determined for the breakwater. Armor stone with a range of sizes from 3,200 lb maximum to 1,900 lb minimum would be used on the sea-side face. Secondary stone would range from 1,900 lb maximum to 200 lb minimum. Core material would be 200 lb maximum to 1 lb minimum. Armor stone thickness would be 5.0 feet, and secondary rock thickness would be 2.5 feet.

A wave runup calculation was performed to determine the crest elevation of the breakwater. During the design storm wave conditions, 4.5 feet of wave runup would result on the face of the breakwater. Using a design still water level of +11.5 ft MLLW, a crest elevation of +16 ft MLLW was selected. A crest width of 7.5 ft was calculated based on the armor size.

A total of 30,600 cubic yards of armor rock, 23,600 cubic yards of secondary rock, and 94,600 cubic yards of core rock would be required for breakwater construction.

Dredged Material Disposal. The dredged material would be disposed of in an intertidal area adjacent to the proposed harbor. The area would provide approximately 3.7 acres of uplands by filling in subtidal areas ranging from -5 ft to +13 ft MLLW. Additional dredged material could be disposed of in the new basin in depths in excess of -20 ft MLLW. Existing bottom conditions are sand, gravel, and cobbles. A total of 70,400 yd^3 of dredged material would be deposited in the disposal areas.

6.3 Aids to Navigation

A self-contained signal lantern has been installed at the head of the existing breakwater as an aid to navigation. Discussions with the U.S. Coast Guard have been conducted to assure that necessary marking of the new entrance channel would be considered. The existing light would be retained, and new navigation lights would be incorporated into the head of both new breakwaters for either alternative 1 or alternative 2. The navigation light at the end of the south breakwater at the dock would remain unchanged. Both new lights would define the new entrance channel.

6.4 Operation and Maintenance Plan

Operation of the completed moorage basin would be the responsibility of the city of Sand Point. The Federal Government would be responsible for the entrance channel, the breakwaters, and the Federal portions of the mooring basin. Representatives of the Corps' Alaska District would make site visits periodically to inspect the breakwaters and would conduct hydrographic surveys every 3 to 5 years for the dredging areas. The hydrographic surveys would be used to verify whether the prediction of minimal maintenance dredging is correct for the entrance channel and basin. Maintenance requirements for the breakwaters would be determined from the surveys and inspections. Local and Federal dredging requirements, if necessary, would probably be combined, so there would be only a single mobilization and demobilization cost.

The breakwaters are designed to be stable for the worst wave conditions. It is therefore anticipated that the structures would not sustain a significant loss of stone over the life of the project. Using a loss of 5 percent of the armor stone over 15 years, an estimated quantity of approximately 1,500 yd^3 of stone would need to be replaced every 15 years for alternative 1 or 2.

6.5 Detailed Quantity and Cost Estimates

Detailed estimates of quantities for dredging and the breakwaters derived for alternatives 1 and 2 are presented in the cost estimate tables (tables 4-2 and 4-3, main report). Dredging quantities were estimated for general navigation features and for other features. The general navigation features include the entrance channel and the harbor basin.

6.6 Construction Schedule

Major construction items include the breakwaters, dredging, and upland fill. The breakwaters would be constructed first. After the breakwaters are completed, work on the dredging may be started concurrently with the upland fill construction. The time needed to construct the project is estimated at 12 months. Construction scheduling would facilitate the continued use of the existing harbor by local fishermen and by fish processing and cargo vessels during construction. The existing city dock would also remain serviceable during construction. Project specifications would outline requirements for the contractor to conduct certain activities during specified time periods to allow continued harbor use.

6.7 Effects of Harbor Improvements Construction

Construction of the Sand Point harbor improvements would not impact the relatively quiescent waters within Popof Strait. Construction would not affect the wave climate or sediment supply of adjacent shorelines to the south and east of the harbor. Improvements in the Federal project area (mooring area and entrance channel) would not adversely impact the adjacent inner harbor areas or tidelands outside the harbor. The entrance channel and mooring basin dredging would not increase shoaling at the harbor entrance or inside the harbor.

Water circulation near Sand Point is driven predominantly by tidal action. The proposed improvements would not impact this pattern. Circulation would be unaffected by wave action during storm conditions. The breakwater would not affect the circulation patterns near Sand Point and would not impact the overall tidal exchange or water quality in the existing harbor.

The proposed improvements would not alter the entrance to Humboldt Slough. Ebb and flood tidal flows through the mouth of the slough would not be impacted.

REFERENCES

Golder Associates. 1997 (Oct). "Geophysical survey at Humboldt Harbor, Sand Point, Alaska," prepared for U.S. Army Corps of Engineers, Alaska District.

National Oceanographic and Atmospheric Administration (NOAA). 1997. *Tidal current tables, Pacific Coast of North America and Asia.*

U.S. Army Corps of Engineers (USACE). 1983. "Hydraulic design of deep-draft navigation projects," Engineer Manual (EM) 1110-2-1613.

USACE. 1984. "Hydraulic design of small boat harbors," EM 1110-2-1615.

USACE. 1984b. *Shore protection manual.*

USACE. 1986. "Engineering and design, design of breakwaters and jetties," EM 1110-2-2904.

USACE. 1989. "Water levels and wave heights for coastal engineering design," EM 1110-2-1414.

USACE. 1994. "Hydraulic design guidance for deep-draft navigation projects," EM 1110-2-1613.

USACE Alaska District. 1969. "Review of reports, Humboldt Harbor at Sand Point, Alaska."

USACE Alaska District. 1973. "General Design Memorandum No. 1, Humboldt Harbor project, Alaska."

USACE Alaska District. 1981. "Small boat harbor Section 107 reconnaissance report, Sand Point, Alaska."

USACE Alaska District. 1983. "Section 107 expanded reconnaissance report, Sand Point, Alaska."

USACE Alaska District. 1986. "Draft detailed project report, Sand Point, Alaska."

USACE Alaska District. 1995. "Reconnaissance report for boat harbor improvements, Sand Point, Alaska."

USACE Alaska District. 1996. "Reconnaissance report for boat harbor improvements, supplement, Sand Point, Alaska."

APPENDIX B

ECONOMIC ANALYSIS
HARBOR IMPROVEMENTS
SAND POINT, ALASKA

CONTENTS

Figures

Tables

appbfintr, appbsec1, appbmra1, appbmra2, appbmra3, appbbens - doc
January 12, 1998

HARBOR IMPROVEMENTS
SAND POINT, ALASKA

APPENDIX B
ECONOMIC ANALYSIS

1. COMMUNITY PROFILE

The purpose of this section is to provide general background information pertaining to the socioeconomic composition of the study area. This information is necessary to enable planners and report reviewers to understand the community infrastructure, the level of economic activity generated from this small rural community, and the potential of the area to support the project under consideration.

1.1 History

A San Francisco fishing company founded Sand Point as a trading point and cod fishing station in 1898. Aleuts from surrounding villages and Scandinavian fishermen were the first residents of the community. Sand Point served as a repair and supply center for gold mining during the early 1900's, but fish processing became the dominant activity in the 1930's. The St. Nicholas Chapel, a Russian Orthodox church, was built in 1933 and is now on the National Register of Historic Places. Aleutian Cold Storage built a halibut plant in 1946. Today, Sand Point is home to the largest fishing fleet in the Aleutian Chain.

The town of Sand Point, as well as the other Aleutians East Borough communities of King Cove, False Pass, Akutan, and Nelson Lagoon, was specifically created to take advantage of commercial fishing opportunities. From the late 1880's through the 1970's, smaller, more remote villages were abandoned as dependence on fishing grew. Residents of Sanak, Unga, Belkofski, Squaw Harbor, Morzhovoi, Thin Point, Wosnesenski and other now-abandoned villages were forced to choose to relocate to one of the four new salmon communities. The transition from a strictly subsistence economy to a more cash-based economy, however, has not been without problems. The entire social and cultural fabric of the remaining Aleut population depends upon their ability to continue living in the region. Any threat to the people's ability to continue their century-old tradition as independent and productive fishers is viewed as a threat to the survival of the Aleut tribes. To protect their interests as much as possible, borough residents have become active participants in fisheries policy and regulatory forums. They have taken a keen interest in State and Federal fisheries management issues, including the Marine Mammal Protection Act, the Magnuson

Act, the Endangered Species Act, and a host of regulatory actions routinely taken by the Alaska Board of Fisheries.

Beginning late in the 19th century, immigrants and local Aleuts alike began hand-lining for cod. The product was salted and loaded on ships headed to the United States and Europe. At the same time, salmon packers began investing in the area, with more permanent operations becoming established about 1911. This era marked the transition from earlier subsistence economies.

1.2 Community Description

The community of Sand Point is located on the northwest side of Popof Island, one of the Shumagin Islands on the Pacific Ocean side of the Alaska Peninsula. Sand Point is part of the Aleutians East Borough, a municipal government formed in 1987 with authority over more than 15,000 square miles of productive lands and waters on the Alaska Peninsula and adjacent islands. Within the borough lie the communities of Akutan, Cold Bay, False Pass, King Cove, Nelson Lagoon, and Sand Point.

The State of Alaska provides sub-regional services in the town through the Alaska Department of Fish and Game and the court system. Trident Seafoods has a major bottomfish and salmon plant in Sand Point that provides fuel and other services to the many fishers in the area. Peter Pan Seafoods owns a storage and transfer station near Humboldt Harbor.

Geographically, biologically, and anthropologically, the area is unique. The borough has borders along the Bering Sea and the open North Pacific Ocean. The area encompasses a number of active and dormant volcanoes, thermal hot springs, petrified forests, maritime tundra, and estuarine grass beds. The region supports substantial populations of caribou, bear, fox, waterfowl, sea birds, marine mammals, and diverse fish and shellfish.

1.3 Climate

The Aleutian Islands and the Alaska Peninsula are manifestations of two of the earth's 12 massive tectonic plates colliding, with the Pacific plate from the south being ground under the North American plate to the north. This geological phenomenon has created a knife-like marine trench extending more than 1,000 miles and reaching depths of more than 4 miles. It is also the birthplace of the Pacific "Ring-of-Fire," where heat from this tremendous friction has spawned volcano after volcano, and the land trembles often with earthquakes. Here, the warmer Pacific Ocean meets the frigid Bering Sea; a turbulent mixing zone of two great bodies of water, spanning a full 1,250 miles east to west.

Sand Point lies in an area dominated by the maritime climate zone. The weather is cloudy and rainy most of the year. Prevailing winds are from the southeast and northwest. The average area temperature for the hottest month is 51.3 °F. The normal maximum temperature is 55.7 °F. The temperature rarely drops below 0 °F.

1.4 Transportation

Sand Point offers a new State-owned airport with a 4,000-foot runway. Direct flights to Anchorage are available. Marine facilities include a 25-acre boat harbor with four docks, 144 vessel slips, and a 150-ton lift.

1.5 Government

The city of Sand Point is incorporated as a first-class city under Title 29 of the Alaska State Statutes. The city council consists of the mayor and six elected members. The council and mayor serve 3-year terms, with the city holding annual elections the first Tuesday in October. Sand Point is one of six cities that together comprise the Aleutians East Borough. (A borough in Alaska is similar to a county in other States.)

1.6 Demographic Data

Most of the fluctuations in Sand Point's population can be attributed to the state of the local economy. Since Sand Point has historically depended on the fishing industry for jobs and income, downward price trends in fishery resources result in a downward trend in resident populations, and vice versa. As the opportunity for local work diminishes, job seekers become attracted to other communities where employment prospects appear more favorable. Overall, fishing has provided the residents of Sand Point with a dependable means of sustenance and therefore has supported a steady increase in population.

In addition to the year-round resident population, each summer the community receives a large influx of fish tenders, seafood processing workers, fishers, and crewmembers. This influx of people generally begins in late May and early June and extends through September.

Sand Point has undergone significant growth over the last three decades. Since the late 1800's, the population of Sand Point has increased during periods of rapid growth in the commercial fisheries industry. The most significant periods of growth occurred during the 1950's and 1980's. Population trends for the city are shown in table 1-1.

TABLE 1-1.-- *Sand Point population history*

Year	Population
1920	60
1940	99
1960	254
1980	625
1990	878
1995	1,022

Source: U.S. Census.

1.7 Employment

Sand Point's economy relies on commercial fishing, related support facilities, and seafood processing. The largest employer in Sand Point is the fishing industry, occupying more than 87 percent of the work force full-time. This is followed by government (city and borough) and local private businesses. Since the vast majority of economic opportunities in Sand Point are tied to the fishing industry, the city has focused efforts at economic development around its boat harbor. Types of full-time and seasonal employment and the proportion of the work force engaged in each are shown in figures 1-1 and 1-2.

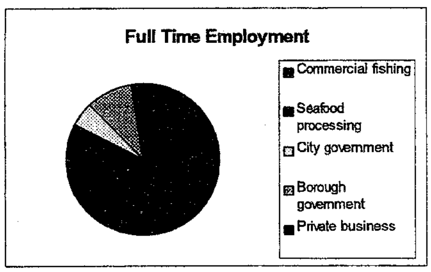


FIGURE 1-1.--Full-time employment in Sand Point..

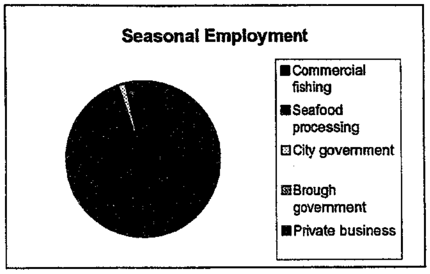


FIGURE 1-2.--Seasonal employment in Sand Point.

1.8 Public Facilities

Humboldt Harbor was constructed in 1976 by the U.S. Army Corps of Engineers. The harbor consists of a north breakwater approximately 1,500 feet long, a south breakwater approximately 1,000 feet long, and an entrance channel dredged to -18 feet mean lower low water (MLLW). Moorage facilities consist of a concrete float system with four main floats. The breakwater creates a mooring basin of approximately 16 acres. Haul-out services are provided. The lift has a capacity of 150 tons, or vessels 100 to 110 feet in length.

The harbor currently contains 144 permanent slips for vessels up to 60 feet in length, 1,400 feet of floating dock to which transient boats can side-tie, and 750 feet of steel sheet bulkhead that can also be used to side-tie vessels. The harbor has a servicing dock with a 42-by-105-foot working area. Additionally, the city recently widened and extended the south breakwater and constructed a 62-by-200-foot dock on the seaward side of the breakwater in a water depth of 30 feet at MLLW. The dock was built to provide space for loading and offloading containers and cargo.

1.9 The Seafood Industry and Sand Point

Sand Point is part of one of three regions in Alaska where the seafood industry is the dominant economic activity. Humboldt Harbor experiences significant demand for temporary moorage by nonresident transient vessels. These vessels use Sand Point facilities throughout the year for moorage during closed fishing periods, to obtain essential provisions for fishing operations, to effect crew rotations, and for protection during adverse weather.

During the June through September red salmon fishing season, Alaskan vessels, as well as vessels from Pacific Northwest communities, operate out of Sand Point, mooring at Humboldt Harbor during closed fishing periods. Tender vessels working in conjunction with the salmon catcher fleet are usually crabber/trawler-class crafts assisting in the salmon harvest by delivering raw product either to floating processors or to local cold storage facilities. At the end of the salmon season, tenders remain in the area to work the winter crab fishery. Bottomfishing goes on throughout the year. These fleets use Sand Point as a service center and location for short-term moorage. Large transients operating in the King Cove area that are turned away due to lack of adequate moorage space also use Sand Point as an alternative harbor.

2. MARINE RESOURCE ASSESSMENT

2.1 Processing Activity at Sand Point

Trident Seafood operates a processing plant in the area, and Peter Pan Seafoods has a buying station for fish and shellfish that is transported to King Cove or other locations for processing. Several tenders are engaged in transporting raw product from Sand Point to King Cove.

A limited amount of groundfish is transported from Sand Point to King Cove because vessels harvesting pollock in the Bering Sea must transit False Pass and then pass by King Cove to reach Sand Point. To deliver product quickly and maintain freshness, the vessels choose to deliver raw product to King Cove rather than transit on to Sand Point with subsequent tendering back to King Cove.

Salmon, followed by Pacific cod, accounts for the largest portion of product tendered between Sand Point and King Cove. The vessels in the area land small amounts of herring and crab, but no processing of these products takes place at the Sand Point plant.

The general schedule for the processing plant and the buying station depends upon fish availability. Changes in plant operation from year to year are common. Pollock is the most significant individual species for the area. January through March, the period of primary operation, is associated with the pollock "A" season in the Bering Sea. The June-through-August period is of secondary importance, as it is a busy time for salmon processing along with small amounts of halibut and blackcod. With the advent of individual fishing quotas, processors are able to accept raw halibut and blackcod over longer periods of time for processing. The September-through-October period is generally associated with pollock processing for the Bering Sea "B" seasons. Pollock, salmon, and cod are the main species processed.

Since only one plant processes product at Sand Point, detailed production figures are not available for reasons of confidentiality. Table 2-1 estimates the pounds landed in the Sand Point area during 1995.

TABLE 2-1.—*Sand Point landed product for 1995*

Species group	Pounds landed
Groundfish	109 million
Salmon	38 million
Miscellaneous	100,000

Table 2-2 summarizes the products processed from the individual species groups.

TABLE 2-2.—*Species and products produced at Sand Point in 1995*

Species group	Products
Pollock	Fillets, surimi, roe
Pacific cod	Fillets, roe
Salmon	Whole fish, fillets, block, roe
Halibut	Whole fish
Blackcod	Whole fish

Note: Fishmeal is a product of all species.

2.2 Bering Sea/Aleutian Fisheries

The waters of the eastern Bering Sea and Aleutian Islands contain some of the richest fisheries in the world. Large quantities of groundfish, herring, salmon, crab, and other species are harvested from the area each year. Numerous factors affect future stocks of fish in the Bering Sea/Aleutian Islands region, such as cycles of resource abundance, climatic conditions, demand for the products produced, and regulatory provisions.

The Aleutians East Borough, strategically located in this area (figure 2-1), is subject to the fluctuations of the fishing industry. Some residents of the borough fish the Gulf of Alaska, but larger boats of interest for this study normally fish the Bering Sea/Aleutian Islands area.

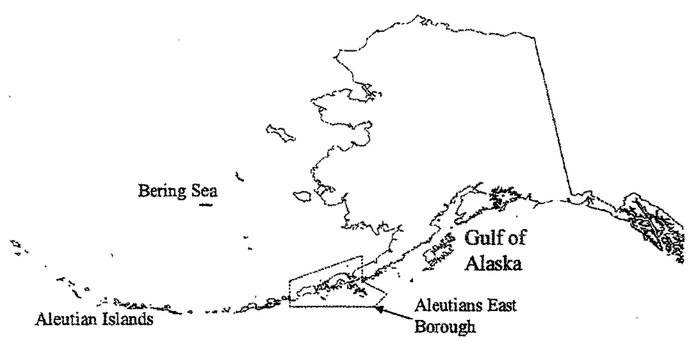


FIGURE 2-1.—Aleutians East Borough.

This assessment of the fisheries in the Bering Sea/Aleutian Islands region is divided into seven subsections: a fisheries management discussion, five fish species categories (groundfish, Pacific halibut, shellfish, salmon, and herring), and a resource summary.

2.3 Fisheries Management

Management and development of the fishery resource in the Bering Sea/Aleutian Islands region are shared responsibilities, divided between international, Federal, State, and quasi-governmental entities. The entities include the National Marine Fisheries Service (NMFS), the North Pacific Fishery Management Council (NPFMC), the Alaska Board of Fisheries, the Alaska Department of Fish and Game (ADF&G), the Pacific States Marine Fisheries Commission (PSMFC), and the International Pacific Halibut Commission (IPHC). Brief descriptions of these agencies follow.

2.3.1 National Marine Fisheries Service.

The NMFS administers the National Oceanic and Atmospheric Administration's (NOAA) programs which support the domestic and international conservation and management of living marine resources. The Alaska regional office, located in Juneau, coordinates Federal and State resource management and research, and monitors and coordinates openings and closures of fisheries within the Exclusive Economic Zone (EEZ). It is responsible for planning and implementing fishery management conservation programs, including fishery management plans established by the NPFMC.

2.3.2 North Pacific Fishery Management Council.

The NPFMC is a body of 11 voting members who are appointed to the council by the region's governors and the Secretary of Commerce. The NPFMC meets five times a year to allocate resources, set management policy, hear testimony from the industry, and consider issues important to the industry which fall under the council's authority. Two major functions of the council are the development and maintenance of fishery management plans for those fisheries under its authority in need of conservation and management (NPFMC 1994). The council also has authority under the 1982 North Pacific Halibut Act to develop regulations, including limiting access, for participants in the Alaska halibut fisheries. Resource allocations are divided by species, by region, and according to the priorities of the Magnuson Act. The NPFMC has management authority from the 3-mile State boundary to the 200-mile EEZ boundary. Fisheries regulations developed by the council are required to meet numerous regulatory standards and must be approved by the Secretary of Commerce.

2.3.3 Alaska Board of Fisheries.

This board accepts proposed changes to the commercial groundfish regulations on an areawide and statewide basis, and considers any other topics related to the management, development, or conservation of the species. The Board of Fisheries allocates the allowable harvest of fish.

2.3.4 Alaska Department of Fish and Game.

The ADF&G is a research and regulatory agency. The Division of Commercial Fisheries within ADF&G is charged with research and management of commercial fisheries in Alaskan waters, which covers waters within 3 nautical miles of shore. Division biologists conduct research on migratory patterns, gear types, and the relative abundance of fish stocks. The department also has the authority to open and close periods based on preseason catch goals and biological considerations.

2.3.5 Pacific States Marine Fisheries Commission.

The PSMFC is one of three interstate commissions dedicated to resolving fishery issues. The commission is comprised of 15 members appointed by State legislatures, State governors, and State fishery directors. Representing California, Oregon, Washington, Idaho, and Alaska, the PSMFC does not have regulatory or management authority; rather, it serves as a forum for discussion and works for coastwide consensus to State and Federal authorities. PSMFC addresses issues that fall outside State or regional management council jurisdiction. The goal is to promote and support policies and actions directed at the conservation, development, and management of fishery resources of mutual concern to member States through a coordinated regional approach to research, monitoring, and utilization.

2.3.6 International Pacific Halibut Commission.

The IPHC was established in 1923 by a convention between Canada and the United States for the preservation of the halibut fishery of the North Pacific Ocean and the Bering Sea. The convention was the first international agreement providing for the joint management of a marine resource. The commission's authority was expanded by several subsequent conventions, the most recent being signed in 1953 and amended by the protocol of 1979. The six-member commission meets annually to review all regulatory proposals, including those made by the scientific staff and the Conference Board, which represents vessel owners and fishers. The commission sets area quotas and seasons for the purpose of stock conservation. The measures recommended by the commission are submitted to the two governments for approval. Upon approval, the regulations are considered Federal regulations and enforced by the appropriate agencies of both governments.

2.3.7 Other Agencies.

Also instrumental in research, gathering information, and marketing the industry are the Alaska Seafood Marketing Institute, the Alaska Fisheries Development Foundation, the Office of International Trade, the Commercial Fisheries Entry

Commission, and the University of Alaska: Components of the University of Alaska with an interest in fisheries include the Institute of Social and Economic Research, the Alaska Center for International Business, the Fisheries Industrial Technology Center, and the Marine Advisory Program.

2.4 Groundfish Fishery

During the early 1980's, foreign trawlers took 98 percent of the groundfish catch in Alaska's offshore fisheries (ADCED 1995). Growing concern for unregulated foreign fishing in U.S. waters led to a preference for domestic processors being written into the federal Magnuson Fishery Conservation and Management Act of 1976, which effectively phased out the foreign fleet. The domestic catch of groundfish off Alaska increased from virtually nothing in 1980 to more than 4.5 billion pounds in the late 1980's (Smith 1992). Pending amendments to the Magnuson Act call for Congress to heed the call for increased conservation.

Many kinds of groundfish are harvested in the waters off Alaska, but the most common species groups are Alaska pollock, Pacific cod, flatfish, rockfish, and sablefish (blackcod). The current harvest level in the Bering Sea/Aleutian Islands area for all groundfish is restricted by the NPFMC to 2 million metric tons for all species (NPFMC 1995). This harvest level is believed to be the limit of long-term sustainable yield under environmental conditions that have prevailed since the 1950's. The Bering Sea/Aleutian Islands region yields approximately 90 percent of the total Alaskan groundfish harvest.

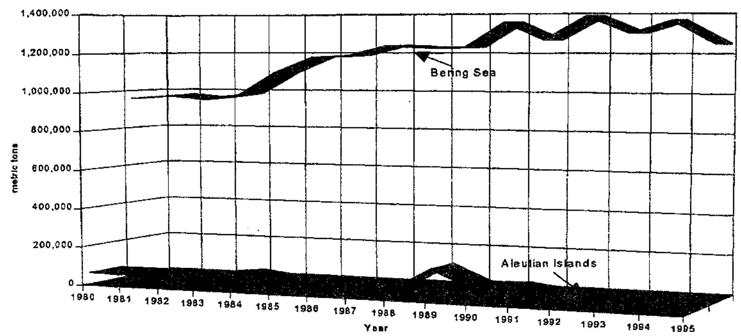
The one constant aspect of the Bering Sea/Aleutian Islands fishing industry is change. The following text and figures demonstrate these fluctuations. As one species declines in abundance, commercial fishing effort is shifted to other species and other areas.

2.4.1 Walleye Pollock.

This is the dominant groundfish species in the Bering Sea, with annual catches in excess of 1 million metric tons per year. Of the total groundfish harvest, the 1995 pollock allowable harvest level is 1.25 million metric tons, or 62.5 percent of the total harvest for all groundfish species, making pollock the most important species by weight. Figure 2-2 depicts the pollock harvest levels for the past 15 years. (Also see table 2-3.) The Aleutian Islands portion of the pollock catch is approximately 6 percent of the total pollock catch for the Bering Sea/Aleutian Islands region.

Pollock are generally a short-lived species, with most of the commercial harvest made up of fish less than 10 years old. The resource abundance has fluctuated in recent years. Pollock stocks are expected to increase in 1996 with recruitment of the 1992 year class, which is expected to be above average (Wespestad 1995). The

Eastern Bering Sea stock is classified as of average relative abundance and stable. The preliminary estimate of eastern Bering Sea biomass is 8.08 million metric tons. The preliminary estimated eastern Bering Sea yield for 1996 is expected to be in the range of 1.27 to 1.45 million metric tons.



Note: 1995 catch levels are through October 28, 1995.
Source: NPFMC 1995a.

FIGURE 2-2.--Pollock harvest levels, Bering Sea/Aleutian Islands, 1980-95.

Table 2-3 estimates average earnings for vessels in the pollock fishery. There are several problems with this estimate. The number of vessels includes vessels targeting other fisheries and harvesting pollock as bycatch, and the value of the harvest is obtained from deliveries to shore-based plants only. The shore-based prices typically represent less than one-third of the total catch. The Alaskan Fisheries Science Center describes these prices as "shaky estimates."[1] The extra vessels with incidental harvest of pollock would tend to understate average earnings, while using the higher shore-based prices would tend to overstate the average vessel earnings. The vertical integration of catcher-processors and catcher vessels owned by processors enables them to allocate costs between harvesting and processing in any manner they choose and construct internal prices that are most advantageous to the firm. Since these internal prices are proprietary to the firm, deliveries to shore-based plants by independently owned vessels are the major data source for prices.

[1] Terry, Joe. Personal communication, Alaska Fisheries Science Center, May 15, 1996.

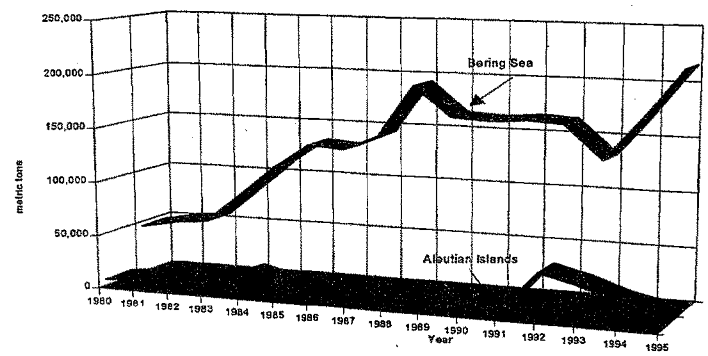
TABLE 2-3.--*Pollock catch levels and values, 1980-95*

Year	EBS Harvest (metric tons)	AI Harvest (metric tons)	Ex-Vessel Value ($ millions)	Number of Vessels	Average Earnings
1980	958,279	58,156			
1981	973,505	55,516			
1982	955,964	57,978			
1983	982,363	59,026			
1984	1,098,783	81,834			
1985	1,179,759	58,730			
1986	1,188,449	46,641	$ 10.00		
1987	1,237,597	28,720	$ 35.30		
1988	1,228,000	43,000	$ 87.50	77	$ 1,136,364
1989	1,230,000	156,000	$ 175.10	107	$ 1,636,449
1990	1,353,000	73,000	$ 256.00	102	$ 2,509,804
1991	1,268,360	78,104	$ 220.60	157	$ 1,405,096
1992	1,384,376	54,036	$ 360.50	200	$ 1,802,500
1993	1,301,574	57,184	$ 197.50	159	$ 1,242,138
1994	1,362,694	58,704	$ 209.90	156	$ 1,345,513
1995	1,250,261	63,748	$ 225.27	155	$ 1,453,355

Note: Vessel count includes vessels targeting other species and catching pollock as bycatch. 1995 catch levels are through October 28, 1995. EBS = Eastern Bering Sea. AI = Aleutian Islands.
Source: NPFMC 1995a. 1995 revenues obtained from Alaska Fisheries Science Center facsimile on May 14, 1996.

2.4.2 Pacific Cod.

This is the second most commercially important species in the Bering Sea. U.S. fishermen have been exploiting the species in the Bering Sea since the mid-19th century. This historic fishery ended in the 1950's and was replaced by fishers from foreign nations. In the early 1980's, U.S. fishers re-entered the Bering Sea cod fishery in response to the decline in world cod stock and increased prices. The cod resource was growing in response to an exceptionally strong 1977 year class. Pacific cod populations have remained strong, allowing annual harvest in recent years ranging from 110,000 metric tons to 216,000 metric tons (figure 2-3 and table 2-4). Total allowable catch levels are not reached due to halibut bycatch quotas. The estimated biomass projected for 1996 is 1.62 million metric tons, and the current (1996) allowable catch level is 250,000 metric tons. Pacific cod abundance is average and appears to be increasing.



Note: 1995 catch levels are through October 28, 1995.
Source: NPFMC 1995a.

FIGURE 2-3.--Pacific cod harvest levels, Bering Sea/Aleutian Islands, 1980-95.

Table 2-4 estimates average earnings for vessels participating in the Pacific cod fishery. As with the pollock fishery, there are several problems with the estimation. The number of vessels includes vessels targeting other fisheries and harvesting Pacific cod as bycatch, and the value of the harvest is obtained from shore-based prices only. The discussion of average vessel earnings for pollock is also applicable for Pacific cod.

2.4.3 Yellowfin Sole.

This species exhibits slow growth with low natural mortality. It is the third most important groundfish species in the Bering Sea. The species has been harvested since the mid-1950's initially by Japanese and U.S.S.R. fishers and later by U.S. fishers. The foreign fleet took large harvests of yellowfin sole, and the population declined to the point where fishing effort was reduced. In the 1970's, the population increased, and the harvests gradually increased also. The foreign fleet ceased harvesting in this fishery in 1986, but some joint ventures continued until 1988. Since that time, the fishery allocation has been entirely allotted to the domestic fleet.

TABLE 2-4.--*Pacific cod catch levels and values, 1980-95*

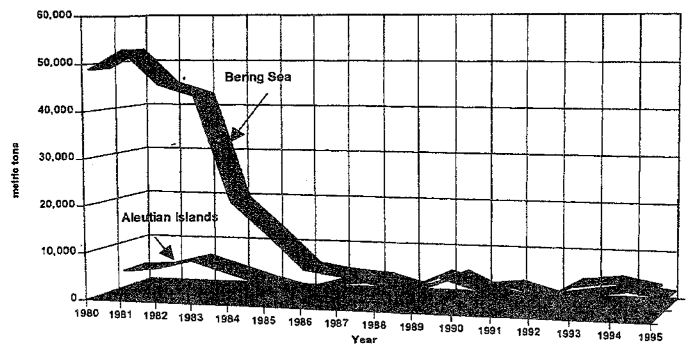
Year	EBS Harvest	AI Harvest	Ex-Vessel Value ($ millions)	Number of Vessels	Average Earnings
1980	45,861	5,788			
1981	51,996	10,462			
1982	55,040	1,526			
1983	83,212	9,955			
1984	110,944	22,216			
1985	132,736	12,690			
1986	130,555	10,332	$ 8.50		
1987	144,539	13,207	$ 17.00		
1988	192,726	5,165	$ 25.70	151	$ 170,199
1989	164,800	4,118	$ 40.30	173	$ 232,948
1990	162,927	8,081	$ 64.70	226	$ 286,283
1991	165,444	6,714	$ 76.20	400	$ 190,500
1992	163,240	42,889	$ 85.30	448	$ 190,402
1993	133,156	34,234	$ 58.50	262	$ 223,282
1994	174,151	22,421	$ 64.60	290	$ 222,759
1995	216,495	15,602	$ 80.19	377	$ 212,706

Note: Vessel count includes vessels targeting other species and catching Pacific cod as bycatch. 1995 catch levels are through October 28, 1995. EBS = Eastern Bering Sea. AI = Aleutian Islands.
Source: NPFMC 1995a. 1995 revenues obtained from Alaska Fisheries Science Center facsimile on May 14, 1996.

Yellowfin sole harvest reached a peak in 1985 with a harvest of 227,000 metric tons. While harvest levels have fluctuated somewhat and have generally decreased since that time, the population remains at a stable, high level and is expected to increase. The biomass is estimated at 2.77 million metric tons, with a total allowable catch set at 190,000 metric tons.

2.4.4 Greenland Turbot.

These fish are taken in the deep waters of the continental slope. The harvests of Greenland turbot were high in the early 1970's, reaching a peak of 69,000 metric tons in 1974. In recent years the harvests have declined in response to restrictions placed on the fishery as the resource abundance declined (figure 2-4). The current biomass is estimated at 150,000 metric tons, with a total allowable catch of 7,000 metric tons. The current fishery for Greenland turbot is primarily as bycatch while fishing other species. The fishery biomass is low and expected to continue declining. The domestic fishery has harvested 100 percent of the catch since 1991.

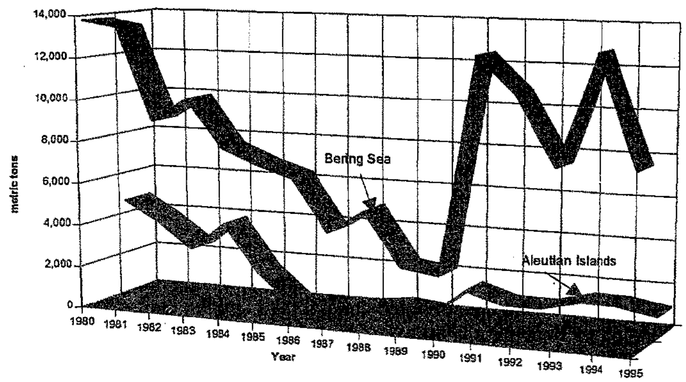


Note: 1995 catch levels are through October 28, 1995.
Source: NPFMC 1995a.

FIGURE 2-4.—Greenland turbot harvest levels, Bering Sea/Aleutian Islands, 1980-95.

2.4.5 Arrowtooth Flounder.

This species has been lightly exploited, with catches averaging 10,000 metric tons during 1980 through 1994 (figure 2-5). Trawl survey biomass estimates indicate the arrowtooth flounder resource has increased to a high level, while exploitation has been limited primarily to bycatch with high discard rates. Catches are frequently discarded overboard in fisheries targeted at Pacific cod, rock sole, other flatfish, and Greenland turbot. The arrowtooth flounder population occupies both continental shelf and slope waters and varies annually in its proportion of the population in each area. Arrowtooth flounder's relative abundance has increased in recent years, but the species is less desirable than other species and harvests are unlikely to rise. The NPFMC has resisted numerous attempts to increase the 2-million-metric-ton overall groundfish cap; therefore, increasing harvests of arrowtooth flounder would mean giving up harvest quotas of a higher-valued species (Tryck Nyman Hayes *et al.* 1995). The projected 1996 exploitable biomass equals 625,000 metric tons, and the total allowable catch is 10,200 metric tons.



Note: 1995 catch levels are through October 28, 1995.
Source: NPFMC 1995a.

FIGURE 2-5.--Arrowtooth flounder harvest levels, Bering Sea/Aleutian Islands, 1980-95.

2.4.6 ***Rock Sole.***

This species has generally been a bycatch in the yellowfin sole fishery, although in recent years a target fishery has developed for roe-bearing rock sole. Because of sustained good recruitment, rock sole biomass increased steadily throughout the 1980's and early 1990's to its present high level of 2.3 million metric tons. The biomass is abundant and increasing. The current (1995) total allowable catch level is 60,000 metric tons. Prior to 1991, rock sole catch was included in other flatfish catch statistics.

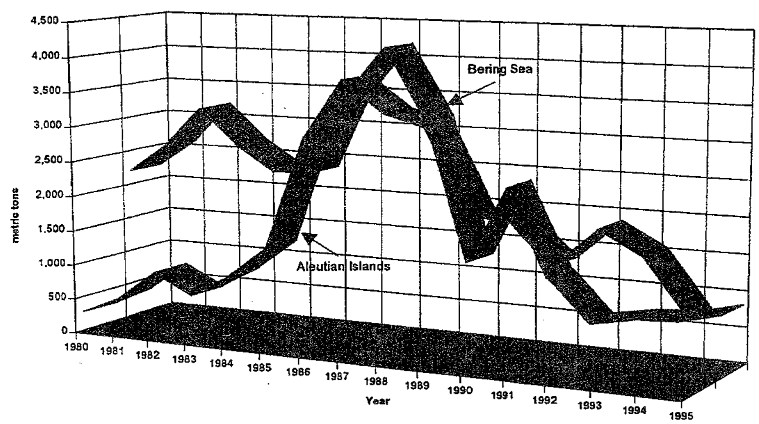
2.4.7 ***Other Flatfish.***

This classification includes rock sole prior to 1991, flathead sole, Alaska plaice, and other minor flatfish species that coexist on the eastern Bering Sea shelf with yellowfin sole. These species have generally been a bycatch of yellowfin sole. The projected 1996 exploitable biomass was 677,000 metric tons, with a total allowable catch of 19,500 metric tons. The relative abundance of the fishery is high and stable.

Due to a change in the Bering Sea/Aleutian Islands directed fishing standards, flathead sole was separated from the "other flatfish" management category for 1995. Its biomass has tripled since 1982, and the relative abundance remains high and increasing. The projected biomass for 1995 was 725,000 metric tons, with a total allowable catch of 30,000 metric tons.

2.4.8 Sablefish (Blackcod).

This species has generally been thought to be more abundant in the Aleutian Islands and Gulf of Alaska regions than in the Bering Sea region. However, the current NPFMC assessment estimates the biomass in the eastern Bering Sea to have increased by approximately 259 percent. The 1996 projected exploitable biomass for the eastern Bering Sea is 16,500 metric tons, with a total allowable catch of 1,600 metric tons. The projected exploitable biomass for the Aleutian Islands area is 13,900 metric tons, with a total allowable catch of 2,200 metric tons. The catch has dwindled significantly in the Bering Sea area, from a high of 26,000 metric tons in 1962 to a low of 558 metric tons in 1992. Meanwhile, the Aleutian Islands catch was at a low of 280 metric tons in 1983 and rose to a high of 3,800 metric tons in 1987 before decreasing to approximately 1,000 metric tons in 1995 (figure 2-6).



Note: 1995 catch levels are through October 28, 1995.
Source: NPFMC 1995a.

FIGURE 2-6.--Sablefish harvest levels, Bering Sea/Aleutian Islands, 1980-95.

Table 2-5 estimates average earnings in the sablefish fishery. As with the pollock and Pacific cod fisheries, there are several problems with the estimation. The number of vessels includes vessels targeting other fisheries and harvesting sablefish as bycatch, and the value of the harvest is obtained from shore-based prices only. The extra vessels with incidental harvest of sablefish would tend to understate average earnings. The discussion regarding the average vessel earnings for pollock also applies to the sablefish fishery. The vertical integration of catcher-processors and catcher vessels owned by processors enables them to allocate costs between harvesting and processing in any manner they choose and construct internal prices that are most advantageous to the firm. Since these internal prices are proprietary to the firm, deliveries to shore-based plants by independently owned vessels are the major data source for prices.

TABLE 2-5.--*Sablefish catch levels and values, 1980-95*

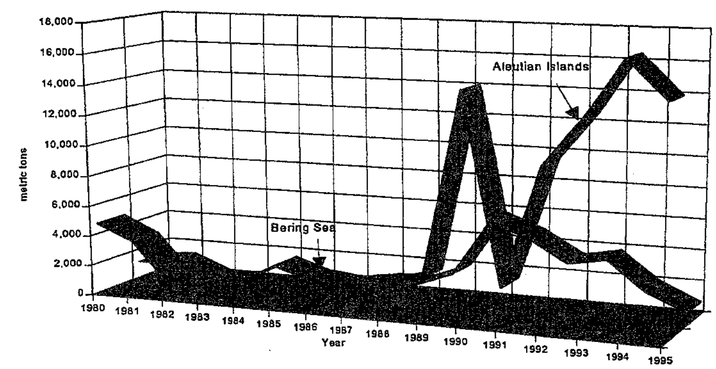
Year	EBS Harvest (metric tons)	AI Harvest (metric tons)	Ex-Vessel Value ($ millions)	Number of Vessels	Average Earnings
1980	2,206	274			
1981	2,604	533			
1982	3,184	955			
1983	2,695	673			
1984	2,329	999			
1985	2,348	1,448			
1986	3,518	3,028	6.60		
1987	4,178	3,834	9.80		
1988	3,193	3,415	13.10	130	$ 100,769
1989	1,252	3,248	7.20	114	$ 63,158
1990	2,329	2,116	6.90	98	$ 70,408
1991	1,128	2,071	7.90	179	$ 44,134
1992	558	1,546	5.20	161	$ 32,298
1993	669	2,078	4.90	128	$ 38,281
1994	699	1,770	6.00	147	$ 40,816
1995	849	1,026	8.63	109	$ 79,174

Note: Vessel count includes vessels targeting other species and catching sablefish as bycatch. 1995 catch levels are through October 28, 1995. EBS = Eastern Bering Sea. AI = Aleutian Islands.
Source: NPFMC 1995a. 1995 revenues obtained from Alaska Fisheries Science Center facsimile on May 14, 1996.

2.4.9 Pacific Ocean Perch.

This complex consists of true Pacific Ocean perch (*Sebastes alutus*) and four other red rockfish species: northern rockfish, rougheye rockfish, sharpchin rockfish, and shortraker rockfish. Prior to 1991, the complex was managed as a unit of each of the two management areas, Eastern Bering Sea and Aleutian Islands. Since 1991, however, the NPFMC has managed *S. alutus* separately from the other species in both areas and has also split out rougheye and shortraker in the Aleutians. The stock assessment for this complex is mainly based on *S. alutus*, the most abundant species in the complex. Survey results indicate that this species declined in abundance during the 1960's and early 1970's and remained low in abundance through the early 1980's. Through a combination of management actions and improved recruitment, the stocks have been recovering slowly.

The yield of these species is relatively low because they are long-lived and slow-growing. However, they have a high commercial value and were early target species harvested by Japanese and U.S.S.R. fishers. Since 1977, the allowable harvests have been at very low levels to allow rebuilding of stocks. The Pacific Ocean perch complex has an aggregate allowable harvest of 19,800 metric tons, and *S. alutus* represents 62 percent of this total. Future projections are for low abundance but stability over the long term. Pacific Ocean perch harvest levels in the Bering Sea region were at a low of 221 metric tons in 1983 after having attained a high of 47,000 metric tons in 1960. (See figure 2-7 for the last 15 years' harvests.)



Note: 1995 catch levels are through October 28, 1995.
Source: NPFMC 1995a.

FIGURE 2-7.--Pacific Ocean perch harvest levels, Bering Sea/Aleutian Islands, 1980-95.

2.4.10 Other Rockfish.

This complex includes both the thornyhead (*Sebastolobus*) species and all *Sebastes* species not included in the Pacific Ocean perch complex. U.S. observers have identified 15 confirmed species within this complex, and another 14 species have been tentatively identified. The complex is managed as two separate stocks, one in the eastern Bering Sea and one in the Aleutian Islands. Most of the catch in this category is incidental.

2.4.11 Atka Mackerel.

These fish are found in the open sea during much of the year but migrate to shallow coastal waters for spawning purposes. From 1970 to 1979, Atka mackerel were landed off Alaska waters exclusively by distant-water fleets. U.S. joint venture fisheries began in 1980 and dominated the landings of Atka mackerel from 1982 through 1988. Since 1990, all Atka mackerel landings have been made by U.S. fishers. Beginning in 1992, total allowable catches increased steadily in response to evidence of a large exploitable biomass (Lowe 1995). Atka mackerel remains a relatively insignificant fishery for the Bering Sea region, but sizable catches have been recorded in the Aleutian Islands area, with a high of 81,000 metric tons in 1995. The stock biomass is considered to have high relative abundance with stability in numbers.

TABLE 2-6.--*Atka mackerel catch levels and values, 1980-95*

Year	EBS Harvest (metric tons)	AI Harvest (metric tons	Ex-Vessel Value ($ millions)	Number of Vessels	Average Earnings
1980	4,955	15,533			
1981	3,027	16,661			
1982	328	19,546			
1983	141	11,585			
1984	57	35,998			
1985	4	37,856			
1986	12	31,978	$		
1987	12	30,049	$ 0.10		
1988	428	21,656	$ 0.80	12	$ 66,667
1989	3,126	14,868	$ 6.40	53	$ 120,755
1990	480	21,725	$ 5.20	34	$ 152,941
1991	2,265	22,258	$ 6.60	36	$ 183,333
1992	2,610	46,831	$ 12.70	65	$ 195,385
1993	201	65,805	$ 7.90	45	$ 175,556
1994	190	69,401	$ 16.00	37	$ 432,432
1995	402	81,053	$ 22.14	36	$ 615,000

Note: Vessel count includes vessels targeting other species and catching sablefish as bycatch. 1995 catch levels are through October 28, 1995. EBS = Eastern Bering Sea. AI = Aleutian Islands.
Source: NPFMC 1995a. 1995 revenues obtained from Alaska Fisheries Science Center facsimile on May 14, 1996.

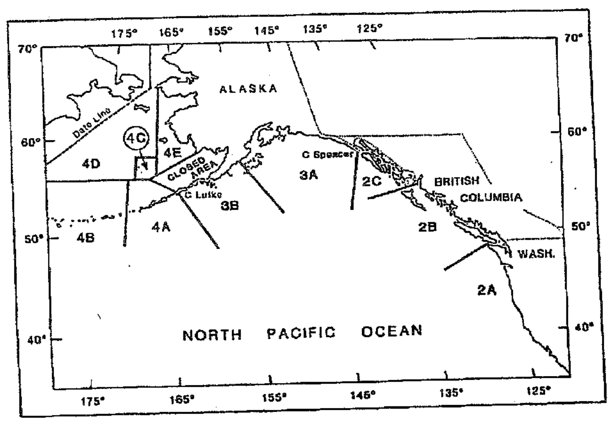
Table 2-6 estimates the average ex-vessel earnings of vessels participating in the Atka mackerel fishery. As with the pollock and Pacific cod fisheries, there are some problems with the estimation. The number of vessels includes vessels targeting other fisheries and harvesting Atka mackerel as bycatch, and the value of the harvest is obtained from shore-based prices only. The extra vessels with incidental harvest of Atka mackerel would tend to understate average earnings. The discussion regarding the average vessel earnings for pollock also applies to the Atka mackerel fishery. The vertical integration of catcher-processors and catcher vessels owned by processors enables them to allocate costs between harvesting and processing in any manner they choose and construct internal prices that are most advantageous to the firm. Since these internal prices are proprietary to the firm, deliveries to shore-based plants by independently owned vessels are the major data source for prices.

2.4.12 Squid and Other Species.

These species, which currently have little commercial value, include smelt, sharks, skates, sculpins, and grenadiers. Many squids and other species in this group are important as food for marine mammals, marine birds, and groundfish. Little is known of the population dynamics for most of the species in this grouping.

2.5 Pacific Halibut

The Pacific halibut (*Hippoglossus stenolepis*), a flatfish, is abundant in the Bering Sea and North Pacific. The International Pacific Halibut Commission (IPHC) was established in 1923 as the first international agreement providing for the joint management of a marine resource between the United States and Canada. The implementation of the Individual Fishing Quota (IFQ) program in 1995 was a major change to the management of the Alaskan commercial halibut fishery. Since it is a new program, regulations have been under review and are still being defined. The program allows the fishing industry to spread landings out over time and make choices to participate in the fishery based on weather and ex-vessel prices for the product.



Source: IPHC 1995.

FIGURE 2-8.--Pacific halibut fishery regulatory areas.

Pacific halibut areas 4A-E and area 3B encompass the Aleutian Islands/Bering Sea region (figure 2-8). The Bering Sea/Aleutian Islands regions contribute 12 to 19 percent of the Alaskan harvest. In recent years, the catch of juvenile halibut in other fisheries, increased efficiency of the halibut fleet, and a dramatic increase in effort have posed challenges for IPHC when managing the fishery stock (IPHC 1995).

2.5.1 Commercial Fishery.

Halibut catches in the IPHC regulatory areas increased during the early 1980's, following a low point in the late 1970's when catches averaged 9,979 metric tons. The commercial harvest peaked in 1988 with a catch of 33,566 metric tons, one of the highest in the history of the fishery. Since then, catches have declined to a level of 26,000 metric tons. The Bering Sea/Aleutian Islands catch (table 2-7) represented 19 percent of the 1995 commercial catch in the regulatory areas covered by the IPHC. Harvests have been declining, and the stock is expected to continue to decline at the rate of about 10-15 percent per year (IPHC 1995).

TABLE 2-7.--*Prices and harvests in the commercial halibut fishery, regulatory areas 3B and 4A-E*

Year	Average Ex Vessel Price/ton	Harvest (Metric Tons)
1990	$ 3,990	6,439
1991	$ 4,409	8,129
1992	$ 2,293	6,907
1993	$ 2,888	6,400
1994	$ 4,299	4,209
1995	$ 4,409	3,582

2.5.2 Recreational Fishery.

Recreational halibut catches in the Bering Sea/Aleutian Islands region are consistently the lowest in the IPHC areas, with an estimated 33 metric tons caught in 1995 compared to management area 3 with 2,388 metric tons and management area 2 with 1,133 metric tons. Recreational fishers catch an average of one-half of 1 percent of the Bering Sea/Aleutian Islands total catch.

2.5.3 Bycatch.

The amount of Pacific halibut caught by fishers targeting other fish and shellfish is substantial. Regulations require that halibut be returned to the sea, and some fish survive. For most fisheries, IPHC relies upon information supplied by Federal observer programs for bycatch estimates. Halibut bycatch mortality was relatively small until the 1960's, when it increased rapidly due to the sudden development of the foreign trawl fisheries off the North American coast. Bycatch mortality reached an estimated 7,258 metric tons in 1994. Fifty-three percent of this, or 3,821 metric tons, can be attributed to the Bering Sea/Aleutian Islands region (IPHC 1995). Most of the groundfish fisheries closures happen because the halibut prohibited species catch (PSC) limits are reached. Adjustments to the allowable catch for bycatch represent compensation to the stock for losses in the stock's reproductive potential. The allowable catch is reduced by 1 pound for every pound of bycatch removed.

2.6 Shellfish

The Bering Sea and Aleutian Islands crab grounds are among the most productive in the world. The predominant species in the area are red king crab and the two tanner crab species, *C. bairdi* and *C. opilio*. In recent years, the *C. opilio* fishery has become the principal revenue source of the commercial crabbing fleet (Tracy 1995). The populations of almost all the crab species in the Bering Sea and Aleutian Islands have fluctuated greatly from year to year. Fisheries for many of the species are currently in decline. Biologists have no definitive explanations for the decline of king and *bairdi* stocks. A number of factors probably contribute, including predation by abundant year classes of Pacific cod and pollock, and oceanographic conditions such as the distinct warming trend in Bering Sea water temperatures that began in 1976 and continued for several years (ResourcEcon *et al.* 1991). A period of cooling water temperatures has begun that may shift the oceanographic conditions to again favor benthic organisms such as king and tanner crab (Northern Economics and ResourcEcon 1992).

Shellfish in the Alaska Peninsula area are at low levels. The king crab fishery has been closed since 1983; the tanner crab (*C. bairdi*) has been closed since 1994; the scallops fishery closed in 1995, and the shrimp fishery closed in 1982. There are small Dungeness crab harvests, but due to the low number of participants, the catch statistics remain confidential.[2]

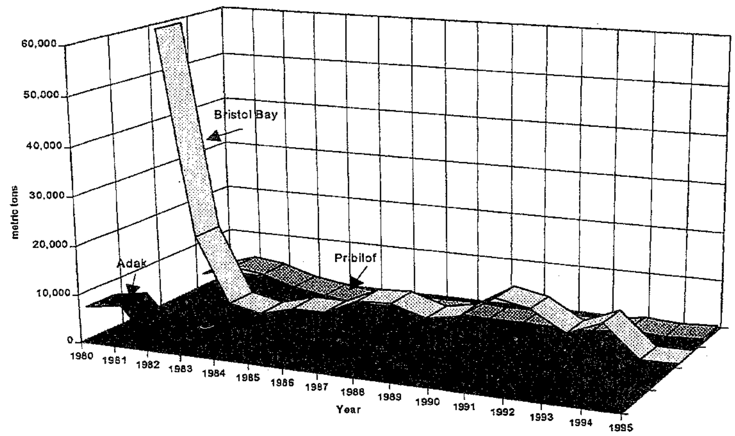
Closed areas have been established in the Bering Sea/Aleutian Islands to protect species and their habitats (Witherell 1995). Some of the areas are seasonal, so that not all areas are closed simultaneously, and some of the areas have been closed specifically to protect the crab resources. Several other measures have been taken to reduce the incidental capture of crabs in groundfish fisheries, including a vessel incentive program and gear restrictions.

---

[2] Jackson, Dave, Alaska Department of Fish and Game facsimile received May 23, 1995.

2.6.1 Red King Crab.

These harvests have fluctuated widely from year to year and from area to area. (See figure 2-9 and table 2-8.) The Dutch Harbor and Bristol Bay areas were closed for the 1995 season, and the Adak area season was significantly reduced. The Pribilof district was opened concurrently with the blue king crab fishery. The Pribilof fishery appears stable, but the ex-vessel value of the harvest is at low levels.



Source: NPFMC 1995b.

FIGURE 2-9.--Red king crab harvests, 1980-95.

TABLE 2-8.--*Red king crab catch levels and values, 1980-95*

	Dutch Harbor					Adak				
Year	Harvest (metric tons)	Number of Vessels	Season Length (Days)	Ex-Vessel Value ($ per metric ton)	Average Ex-Vessel Value	Harvest (metric tons)	Number of Vessels	Season Length (Days)	Ex-Vessel Value ($ per metric ton)	Average Ex-Vessel Value
1980	6,809	104	122	$ 1,984	$ 129,902	212	18			
1981	8,011	114	73	$ 2,249	$ 158,017	644	17	72	$ 2,028	$ 76,821
1982	632	54	31	$ 2,271	$ 26,569	748	46	107	$ 4,431	$ 72,051
1983	2,338	92	106	$ 5,071	$ 128,884	772	72	76	$ 7,584	$ 81,309
1984	196	81	76	$ 7,562	$ 18,259	899	106	340	$ 7,562	$ 64,121
1985	closed					620	64	97	$ 4,630	$ 44,877
1986	closed					411	35	107	$ 4,740	$ 55,672
1987	closed					323	33	107	$ 8,488	$ 83,095
1988	closed					551	71	107	$ 8,818	$ 68,391
1989	closed					711	73	34	$ 11,023	$ 107,350
1990	closed					507	56	107	$ 9,259	$ 83,893
1991	closed					376	7	107	$ 8,818	$ 473,204
1992	closed					431	10	107	$ 6,614	$ 285,384
1993	closed					584	12	76	$ 11,133	$ 541,371
1994	closed					317	12	107	$ 8,532	$ 225,130
1995	closed					89	20	27	$ 12,125	$ 54,166

	Bristol Bay					Pribilof				
Year	Harvest (metric tons)	Number of Vessels	Season Length (Days)	Ex-Vessel Value ($ per metric ton)	Average Ex-Vessel Value	Harvest (metric tons)	Number of Vessels	Season Length (Days)	Ex-Vessel Value ($ per metric ton)	Average Ex-Vessel Value
1980	58,945	236	40	$ 1,984	$ 495,567	2,719				
1981	15,237	177	91	$ 3,307	$ 284,673	4,976	110	60	$ 1,984	$ 89,758
1982	1,361	90	30	$ 6,724	$ 101,708	4,119	99	47	$ 3,307	$ 137,587
1983	closed					1,998	122	15	$ 6,724	$ 110,134
1984	1,897	89	15	$ 5,732	$ 122,183	995	126	10	$ 6,614	$ 52,224
1985	1,894	128	8	$ 6,393	$ 94,589	139	16	15	$ 5,511	$ 47,922
1986	5,168	159	13	$ 8,929	$ 290,223	242	26	26	$ 6,393	$ 59,421
1987	5,574	236	12	$ 8,818	$ 208,290	117	16	55	$ 8,929	$ 65,544
1988	3,351	200	8	$ 11,243	$ 188,389	318	38	86	$ 8,818	$ 73,825
1989	4,656	211	12	$ 11,023	$ 243,242	closed				
1990	9,236	240	12	$ 11,023	$ 424,216	closed				
1991	7,792	302	7	$ 6,614	$ 170,642	closed				
1992	3,648	281	7	$ 11,023	$ 143,114	closed				
1993	6,636	292	9	$ 8,377	$ 190,373	1,183	112	6	$ 10,979	$ 115,947
1994	closed					607	104	6	$ 13,228	$ 77,247
1995	closed					970	119	7	$ 6,944	$ 56,611

Note: Pribilof catch levels prior to 1988 represent catches of blue king crab; the 1995 Pribilof harvest includes both red king crab and blue king crab.
Source: ADF&G 1996.

The Alaska Department of Fish and Game conducted a survey of the Dutch Harbor area in 1994, and indications are that a further reduction in the stocks has occurred. A total of two red king crab were caught. Based on these results, no recovery is expected in the near future.

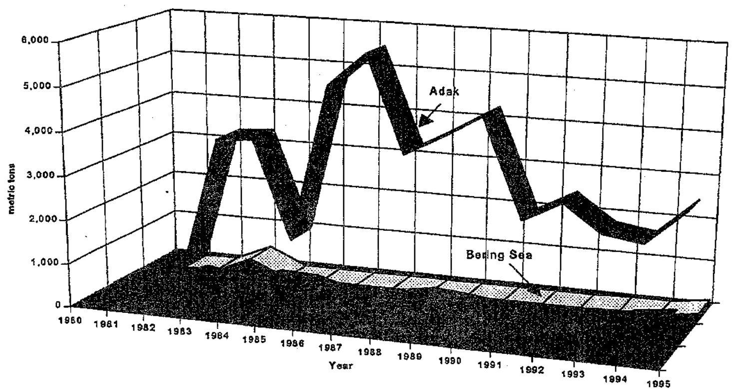
The Adak red king crab fishery began in 1961. Historically, the character of this fishery has been one of intermittent participation of low intensity. Most participants move into this fishery for short periods, normally before or after other major fisheries. Since 1988, on-board fisheries observers have been required on processing vessels. This imposition has led to a drop in the number of vessels participating, from 11 in 1988-89 to one vessel in the 1993-94 fishery. The high price of Adak red king crab for the 1994-95 season, $5.50 compared to $3.87 for the prior year, is attributable to the closing of the Bristol Bay fishery. Figure 2-9 and table 2-8 depict the red king crab harvest levels for the Bering Sea/Aleutian Islands region. Compared to historic levels, the population appears to be severely depressed.

2.6.2 Brown King Crab.

These crab inhabit deeper waters along steep, rocky dropoffs near large inter-island passes. The fishery is currently made up primarily of catcher-only vessels, since the 1988 ruling requiring processors to carry onboard fisheries observers. To continue collecting information in this fishery, the Alaska Board of Fish implemented regulations requiring observers on all vessels beginning with the November 1 startup of the 1995-96 Adak brown king crab fishery.

The brown or golden king crab fishery in the Aleutian Islands is the fourth largest shellfish fishery in Alaska. The fishery has exhibited greater stability than populations of other king crab, probably due to the difficult nature of the fishery for this species. The crabs are harvested in the Adak District, the Dutch Harbor District, and the Pribilof area of the Bering Sea, where very limited harvest occurs (figure 2-10). The Adak brown king crab fishery began during the 1975-76 season. Limited information is available on the Adak fishery, which has relied in the past on collection of information through onboard fisheries observers. No population estimates have been made for brown king crab stocks in the Pribilof area of the Bering Sea. High catches in the early years of the fishery disappeared as the virgin stock was exploited, and recruitment has been unable to sustain the fishery in the Bering Sea region.

Fishers began to target brown king crab in the Adak region for the first time during the 1981-82 season. In the Dutch Harbor region, harvests were historically taken incidental to the red king crab fishery. Interest in the fishery has grown as red king crab stocks have declined (table 2-9). Intensified fishing effort in the Dutch Harbor area prompted the Board of Fish to provide regulations requiring observer coverage on all vessels as of September 1, 1995. The Pribilof harvest numbers are small and considered confidential for most of the last 15 years. Therefore, no attempt was made to estimate average ex-vessel value for the Pribilof area.



Source: NPFMC 1995b.

FIGURE 2-10.--Brown king crab harvest levels, 1980-95.

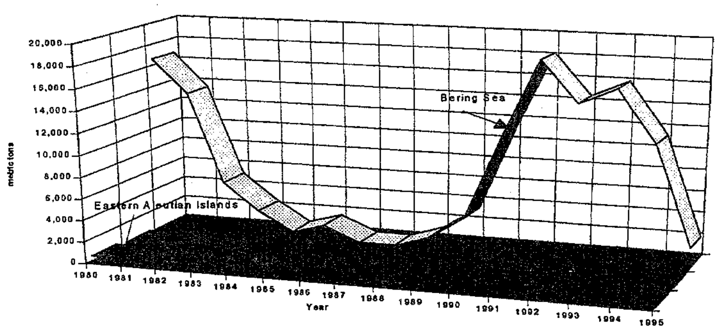
TABLE 2-9.--*Brown king crab catch levels and values, 1980-95*

	Dutch Harbor					Adak					Pribilof
Year	Harvest (metric tons)	Number of Vessels	Season Length (Days)	Ex-Vessel Value ($ per metric ton)	Average Ex-Vessel Value	Harvest (metric tons)	Number of Vessels	Season Length (Days)	Ex-Vessel Value ($ per metric ton)	Average Ex-Vessel Value	Harvest (metric tons)
1980	0					11					
1981	52	6	75	$ 4,519	$ 39,536	27	4	72	$ 1,984	$ 13,256	0
1982	538	49	105	$ 6,614	$ 72,549	542	14	227	$ 4,541	$ 175,696	32
1983	821	47	105	$ 6,724	$117,521	3,632	99	166	$ 6,636	$ 243,424	388
1984	690	13	229	$ 2,976	$157,965	3,687	157	157	$ 6,437	$ 151,171	0
1985	893	13	121	$ 4,409	$302,803	1,442	38	240	$ 4,409	$ 167,374	C
1986	848	17	182	$ 6,283	$313,363	5,046	49	288	$ 5,511	$ 567,591	C
1987	627	22	62	$ 6,283	$179,187	5,805	62	288	$ 6,614	$ 619,260	C
1988	701	21	93	$ 6,614	$220,731	3,629	46	289	$ 6,614	$ 521,817	C
1989	840	13	104	$ 7,716	$498,683	4,119	74	288	$ 7,055	$ 392,658	C
1990	780	16	68	$ 6,614	$322,285	4,610	64	288	$ 6,614	$ 476,363	0
1991	657	11	74	$ 4,409	$263,225	2,382	13	288	$ 6,614	$1,211,699	C
1992	616	10	76	$ 5,511	$339,263	2,837	16	289	$ 5,511	$ 977,253	C
1993	415	4	212	$ 4,740	$492,061	2,230	18	288	$ 4,519	$ 559,896	31
1994	794	14	57	$ 8,818	$500,077	2,103	21	288	$ 5,511	$ 551,868	40
1995	904	17	38	$ 5,732	$304,962	2,893	34	288	$ 7,341	$ 624,673	155

Note: C = Confidential catch records. Insufficient information is available to determine average ex-vessel value for the Pribilof Islands area.
Source: ADF&G 1996.

2.6.3 C. Bairdi *Tanner Crab.*

This fishery in the Bering Sea region achieved a high of 18,000 metric tons for the 1991 season (figure 2-11). The Eastern Aleutians District has been a rather small part of this fishery, and seasonal catches remain significantly less than 1 million pounds. The fishery began in Akutan and Unalaska bays, but has since expanded to include all areas known to contain tanner crab. A 1994 survey showed a significant decline in the population, which prompted an emergency closure for the 1995 season. The Western Aleutians tanner crab fishery has also remained small, with no reported catch for the 1993-94 season. The majority of the tanner crab harvest originates in the Bering Sea District, though the 1994 National Marine Fisheries Service (NMFS) survey indicates that the abundance of crabs there has declined significantly from prior years (Morrison and Gish 1995).



Source: NPFMC 1995b.

FIGURE 2-11.--Tanner crab (C. bairdi) *harvest levels, 1980-95.*

The Eastern Aleutians area was closed to tanner crab *(C. bairdi)* for the 1995 season due to survey results indicating a 750 percent decline in the population. The Western Aleutians area harvests have generally been incidental to the Adak red king crab fishery; no deliveries were made for the 1993-94 and 1994-95 seasons. The Bering Sea region saw a significantly reduced season length and harvest for 1995 (table 2-10).

TABLE 2-10.--*Tanner crab* (C. bairdi) *catch levels and values, 1980-95*

	Eastern Aleutian Islands					Western Aleutian Islands					Bering Sea				
Year	Harvest (metric tons)	Number of Vessels	Season Length (Days)	Ex-Vessel Value ($ per metric ton)	Average Ex-Vessel Value	Harvest (metric tons)	Number of Vessels	Season Length (Days)	Ex-Vessel Value ($ per metric ton)	Average Ex-Vessel Value	Harvest (metric tons)	Number of Vessels	Season Length (Days)	Ex-Vessel Value ($ per metric ton)	Average Ex-Vessel Value
1980	402	18	225	$ 1,146	$ 25,610	153	10	225	$ 1,146	$ 17,539	16,608	152	189	$ 1,146	$ 125,260
1981	297	29	150	$ 1,279	$ 13,090	100	9	165	$ 1,190	$ 13,243	13,440	165	88	$ 1,279	$ 104,156
1982	336	31	120	$ 2,756	$ 29,826	380	17	166	$ 2,866	$ 64,136	4,994	125	118	$ 2,337	$ 93,355
1983	248	23	120	$ 2,646	$ 28,582	222	61	225	$ 2,800	$ 10,168	2,392	108	118	$ 2,646	$ 58,599
1984	109	16	120	$ 2,160	$ 14,675	174	31	216	$ 2,094	$ 11,772	548	41	118	$ 2,094	$ 27,995
1985	75	6	150	$ 2,866	$ 35,865	74	31	216	$ 2,866	$ 6,855	1,430	44	149	$ 3,086	$ 100,275
1986	76	9	150	$ 3,307	$ 27,890	94	15	225	$ 882	$ 5,515	closed				
1987	73	7	150	$ 4,409	$ 45,798	19	8	225	$ 3,307	$ 8,018	closed				
1988	141	19	84	$ 4,630	$ 34,254	64	15	171	$ 4,630	$ 19,795	1,003	98	93	$ 4,784	$ 48,945
1989	148	12	112	$ 6,393	$ 78,879	68	36	188	$ 2,205	$ 4,139	3,181	109	110	$ 6,393	$ 186,584
1990	78	10	83	$ 4,078	$ 31,780	22	12	160	$ 2,205	$ 4,062	11,136	179	89	$ 4,078	$ 253,722
1991	23	5	75	$ 2,756	$ 12,510	7	5	145	$ 2,756	$ 3,695	18,181	255	126	$ 2,469	$ 176,045
1992	45	6	75	$ 3,858	$ 28,788	4	8	151	$ 2,205	$ 976	14,423	285	137	$ 3,307	$ 167,350
1993	54	7	75	$ 3,748	$ 28,605	C					15,935	294	147	$ 3,858	$ 209,113
1994	76	8	75	$ 5,181	$ 48,923	0					11,185	261	62	$ 6,239	$ 267,367
1995	closed					0					1,920	196	15	$ 6,173	$ 60,472

Note: C = Confidential catch record.
Source: ADF&G 1996.

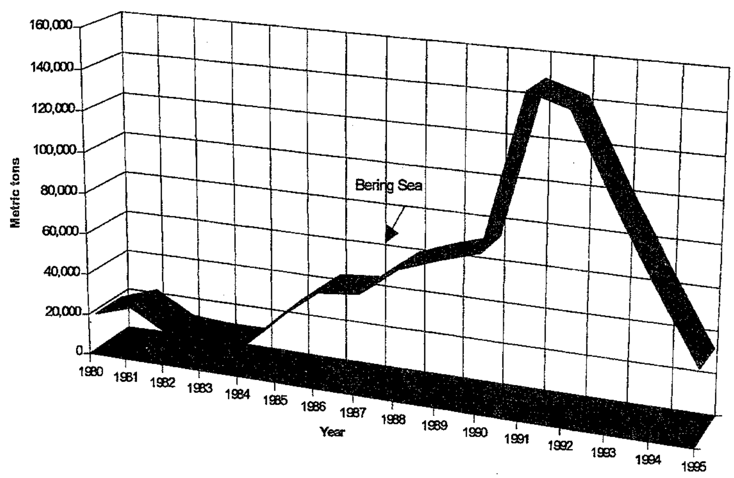
2.6.4 C. Opilio *Tanner Crab.*

These crab are harvested in the Bering Sea region. The first reported landings of *C. opilio* were made during the 1977-78 season incidental to the *C. bairdi* harvest. Catches in this fishery peaked in 1991 at 149,000 metric tons, up from a low of 12,000 metric tons in 1983 and 1984 (figure 2-12).

The 1995 *C. opilio* tanner crab season was plagued with sea ice and strong northerly winds which claimed one vessel on opening day. Season length has decreased while the number of vessels participating in the fishery has increased (table 2-11).

2.6.5 C. Tanneri *Tanner Crab.*

Reported landings of this species first occurred in the late 1970's as incidental to the brown king crab fishery in the Adak Management Area. It was during the 1993 season that a commercial interest in the fishery first took hold. Onboard observers have been required on all vessels beginning in 1994. Fewer than three vessels participated in the Eastern Aleutians 1993 season and the Western Aleutians 1993 and 1994 seasons; consequently, information is confidential for those years (figure 2-13).



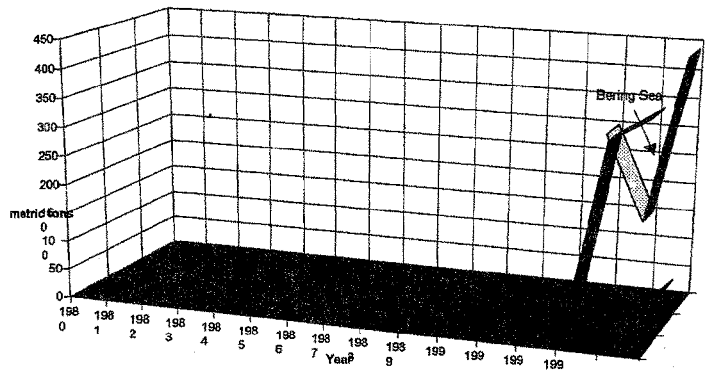
Source: NPFMC 1995b.

FIGURE 2-12.--C. opilio *tanner crab harvests, 1980-95.*

TABLE 2-11.--C. opilio *tanner crab catch levels and values, 1980-95*

	Bering Sea				
Year	Harvest (metric tons)	Number of Vessels	Season Length (Days)	Ex-Vessel Value ($ per metric ton)	Average Ex-Vessel Value
1980	17,950	134	307	$ 463	$ 62,017
1981	23,927	153	229	$ 573	$ 89,641
1982	13,316	122	167	$ 1,609	$ 175,651
1983	11,852	109	120	$ 772	$ 83,899
1984	12,162	52	320	$ 661	$ 154,691
1985	29,937	75	333	$ 661	$ 263,996
1986	44,446	88	252	$ 1,323	$ 668,078
1987	46,223	103	158	$ 1,653	$ 742,016
1988	60,810	171	120	$ 1,698	$ 603,664
1989	67,793	168	112	$ 1,653	$ 667,215
1990	73,402	189	149	$ 1,411	$ 547,968
1991	149,074	220	159	$ 1,102	$ 746,927
1992	143,021	250	97	$ 1,102	$ 630,605
1993	104,685	254	59	$ 1,653	$ 681,459
1994	67,938	273	45	$ 2,866	$ 713,219
1995	34,135	253	33	$ 5,357	$ 722,784

Source: ADF&G 1996.



Source: NPFMC 1995b.

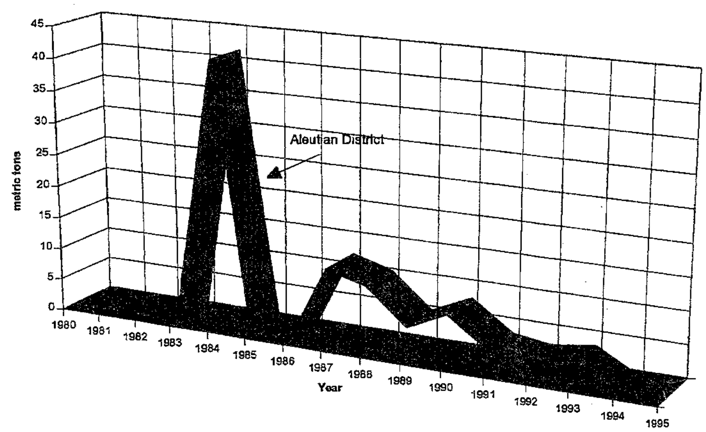
FIGURE 2-13.--C. tanneri *tanner crab harvests, 1993-95.*

2.6.6 Dungeness Crab.

These crab prefer shallow bays, unlike the deep-water red and brown king crab. Shallow areas suitable to Dungeness populations are few in the Aleutians, which explains the small populations and low effort in the district. The Aleutian Dungeness crab fishery is primarily a small-vessel, summer fishery occurring in the vicinity of Unalaska Island. Interest and activity in this fishery have been erratic from year to year, with the first reliable reports made in 1970. No vessels participated in this fishery during the 1994-95 season (figure 2-14). Table 2-12 demonstrates the low interest and activity in the Dungeness crab fishery.

2.6.7 Korean Hair Crab.

Sold commercially as "kegani" by the Japanese, this species was fished for the first time by the U.S. fleet in 1978-79. Most fishing effort has been concentrated in waters adjacent to the Pribilof Islands. Korean hair crab require different handling procedures, which led the Alaska Board of Fish to designate specially designed hair crab pots. The harvest comes predominantly from the Pribilof Islands.



Source: NPFMC 1995b.

FIGURE 2-14.--Dungeness crab harvest in Aleutian Islands, 1980-95.

TABLE 2-12.--*Dungeness crab catch levels and values, 1980-95*

	Aleutian Islands				
Year	Harvest (metric tons)	Number of Vessels	Season Length (Days)	Ex-Vessel Value ($ per metric ton)	Average Ex-Vessel Value
1980	0				
1981	0				
1982	C				
1983	C				
1984	42	4	302	$ 2,932	$ 30,503
1985	C				
1986	C				
1987	12	5	183	$ 2,094	$ 5,059
1988	10	6	183	$ 1,984	$ 3,395
1989	5	4	183	$ 1,984	$ 2,503
1990	8	3	183	$ 1,984	$ 5,210
1991	3	4	183	$ 2,756	$ 2,316
1992	3	4	183	$ 1,764	$ 1,130
1993	3	5	183	$ 1,720	$ 1,175
1994	0				
1995	0				

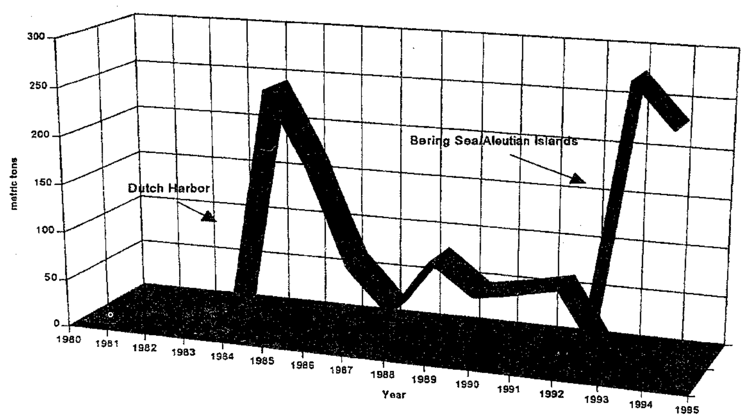
Note: C = Confidential catch record.
Source: NPFMC 1995b.

2.6.8 Scallops.

Fishing records indicate the first harvest of Weathervane scallops in Dutch Harbor took place in 1982. Commercial catch records indicate scallops were first harvested from the Bering Sea/Aleutian Island management area in 1987. During the beginning years, fewer than three vessels fished for scallops in this area. As a result, catch and effort data are confidential or not reported (figure 2-15). No harvest guidelines for scallops have been established for the Bering Sea/Aleutian Islands region, though crab bycatch caps were instituted for the scallop fishery beginning in 1993. The 1994 fishery was plagued by tanner crab bycatch and subsequently closed by emergency order.

2.6.9 Shrimp.

This fishery began in 1972 and has been predominantly a trawl fishery. Sharp declines in catches since 1978 prompted a reduction in season length. Between 1983 and 1992, no fishing occurred. No vessels registered for the 1994 season.



Source: NPFMC 1995b.

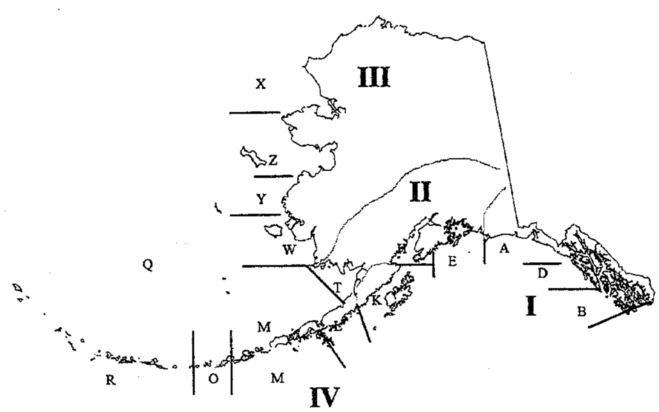
FIGURE 2-15.--Scallops harvest in Bering Sea/Aleutian Islands region, 1980-95.

2.6.10 Miscellaneous Species.

These include octopus, urchins, and snails. Four vessels registered and participated in the Bering Sea snail fishery in 1994. Most of the fishing activity took place around the Pribilof Islands, for a total of 919 metric tons.

2.7 Salmon

The major species of salmon harvested in Alaska are chinook (king), sockeye (red), coho (silver), pink (humpback or humpy), and chum (dog). Salmon are managed by the Alaska Department of Fish and Game by region and area under a license limitation system (*i.e.,* the participants must hold a valid permit to fish a species). The focus of this assessment is Areas M and T, the Alaska Peninsula area, which encompasses the Aleutians East Borough. The regions and areas are shown in figure 2-16. The permits are specific to area and the type of gear used for harvesting (*e.g.*, Area M drift-net). The most important gears are seines and set and drift gill nets, except for chinook salmon, where trolling is an important gear type (Knapp and Smith 1991). Permits were initially allocated to fishers in 1976 on the basis of past participation in the salmon fisheries. At present, permits can be obtained only by purchase from a current permit holder.



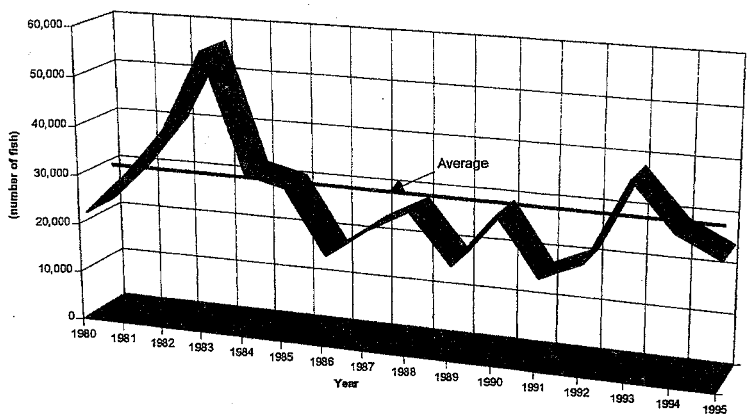
Source: Knapp and Smith 1991.

FIGURE 2-16.--Management areas and regions used by the Alaska Department of Fish and Game.

Salmon harvest prices vary between regions and species. Contributing factors to the price differences include transportation costs to processing plants or sending finished products to market, varying processing costs in different locations, and fish quality variations from one region to another or the timing of the catch, which leaves the harvest in varying degrees of quality. In 1994, pink salmon accounted for almost 60 percent of the catch, but sockeye salmon accounted for 71 percent of the ex-vessel value. The 1994 Alaska Peninsula and Aleutian Islands fishery had a ex-vessel value of $38.67 million with 476 vessels participating, for an average ex-vessel value of $81,250.

2.7.1 Chinook.

Harvests of these fish in the Alaska Peninsula and Aleutian Islands region have averaged 28,000 fish over the past 15 years, peaking at 56,000 in 1983 and falling to 17,000 in 1986 and 1991 (figure 2-17). Drift gill-netters primarily capture chinook salmon, yet harvests have been less than 1 percent of the total Area M salmon catch over the past 15 years. The catch reached a high of .57 percent in 1983 and a low of .10 percent in 1991 and 1995, averaging .22 percent. The ex-vessel value of the 1994 catch was $315,000.

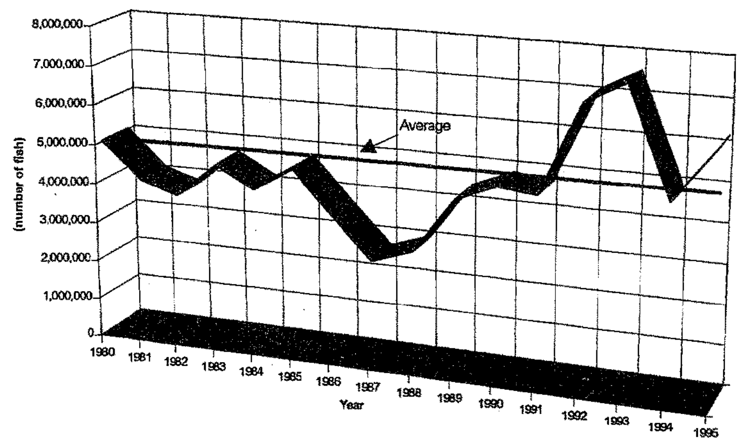


Source: ADF&G 1994; Alaska Board of Fish for 1995 catch.

FIGURE 2-17.--Chinook salmon harvests, Area M, 1980-1995.

2.7.2 Sockeye.

Harvests of this species in the Alaska Peninsula and Aleutian Islands region averaged 4.7 million fish over the past 15 years, peaking at 7.5 million fish in 1993 and falling to 2.6 million fish in 1987 (figure 2-18). The catch has averaged 33 percent of the total catch for the area over the past 15 years, peaking at 47 percent in 1983 and reaching a low of 20 percent in 1984. The 1994 ex-vessel value of the harvest was $26.9 million.



Source: ADF&G 1994; Alaska Board of Fish for 1995 catch.

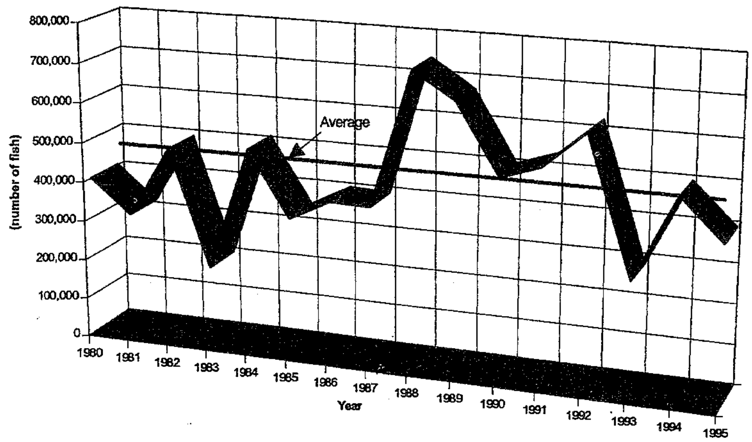
FIGURE 2-18.--Sockeye salmon harvests, Area M, 1980-1995.

2.7.3 Coho.

Coho harvests in the Alaska Peninsula and Aleutian Islands region have averaged 457,000 fish over the past 15 years, peaking at 740,000 fish in 1988 and falling to 200,000 in 1983 (figure 2-19). The catch averaged slightly more than 3 percent of the total harvest over the past 15 years, peaking at 6.6 percent in 1987 and reaching a low of 1.5 percent in 1993. The ex-vessel value of the harvest in 1994 was $2.32 million.

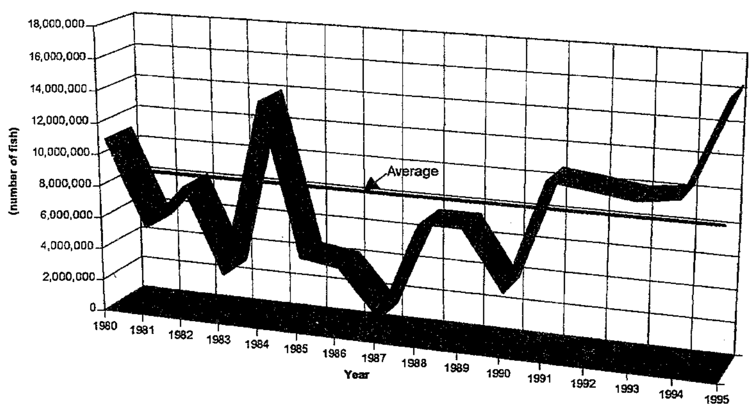
2.7.4 Pink.

Harvests of pink salmon in the Alaska Peninsula and Aleutian Islands region have averaged 7.9 million fish over the past 15 years, peaking at 16.3 million in 1995, a historic record, and falling to 1.2 million fish in 1987 (figure 2-20). The majority of the salmon harvest most years is pink salmon; pinks have averaged 49 percent of the total salmon harvest over the past 15 years. The peak year was 1984, with 66 percent of the catch, and the low was 1987, with 20 percent of the catch. The ex-vessel value of the 1994 harvest was $5.22 million.



Source: ADF&G 1994; Alaska Board of Fish for 1995 catch.

FIGURE 2-19.--Coho salmon harvests, Area M, 1980-1995.



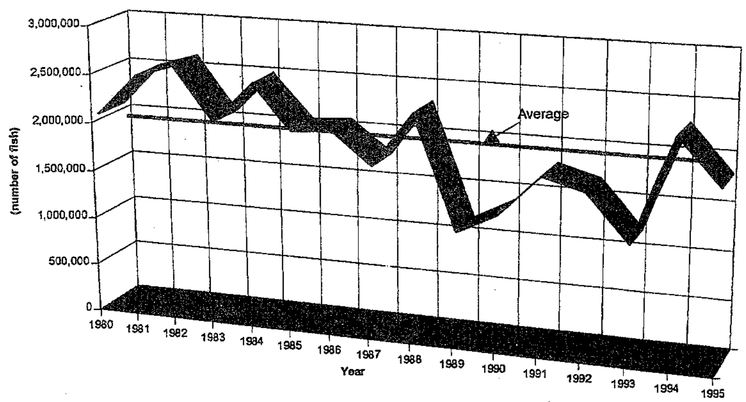
Source: ADF&G 1994; Alaska Board of Fish for 1995 catch.

FIGURE 2-20.--Pink salmon harvests, Area M, 1980-1995.

2.7.5 *Chum.*

Harvests of chum salmon in the Alaska Peninsula and Aleutian Islands region averaged 1.9 million fish over the past 15 years, peaking at 2.6 million in 1982 and falling to 1.2 million in 1989 and 1993 (figure 2-21). Chum salmon averaged 14.5 percent of the catch over the past 15 years, peaking at 29 percent in 1987 and reaching a low in 1993 with just 6 percent of the total catch. The 1994 ex-vessel value of the harvest was $3.85 million.

In 1986 a chum ceiling (harvest limit) was placed on the South Unimak and Shumagin Islands fisheries due to concerns that the South Peninsula fisheries were capturing chum salmon destined for the Yukon-Kuskokwim River system (McCullough *et al.* 1995). In 1986, 1988, and 1991 the sockeye harvests were below guideline harvest levels, due primarily to achieving the chum cap levels before the sockeye allocations were reached. Since 1992, the chum cap has been increased to 700,000 fish, and the sockeye harvests have achieved guideline levels.



Source: ADF&G 1994; Alaska Board of Fish for 1995 catch.

FIGURE 2-21.--Chum salmon harvests, Area M, 1980-1995.

2.8 Herring

Fluctuations in harvest and effort for sac roe herring in the south Alaska Peninsula have continued since the fishery began in 1979. The north peninsula sac roe fishery has seen similar fluctuations since its inception in 1982.

The 1994 commercial sac roe Pacific herring season extended from April 15 through July 15 in Alaska Peninsula and Aleutian Islands waters. Sac roe herring catches occurred from May 21 through June 7 in waters of the north peninsula, and June 2-3 in waters of the south peninsula. A herring food/bait fishery in the Dutch Harbor region occurred during July 16-19 (McCullough and Campbell 1995).

The fishery is managed by the Alaska Department of Fish and Game so that the exploitation rate on eastern Bering Sea herring stocks does not exceed 20 percent of the biomass of those stocks (McCullough and Campbell 1995). The objective of the department is to strive for the highest level of product quality with a minimum of waste. Herring is taken primarily by purse seines, with a few gill nets. Airplanes are often used to locate concentrations of herring.

2.8.1 Sac Roe Fishery.

In 1994, 7.4 metric tons was harvested in the South Peninsula area. This was more than six times below the 1993 catch of 87.8 metric tons and well below the high of 1981, when the fishery harvested 723.4 metric tons (table 2-13, figure 2-22).

TABLE 2-13.--*Sac roe herring fishery catch levels and values, Alaska Peninsula (North and South) Management Area, 1980-94*

Year	Sac Roe (metric tons)	Length of Season (Days)	Number of Vessels	Ex-Vessel Value	Average Value per Vessel
1980	411.7	57	6	$ 381,184	$ 63,531
1981	723.4	46	56	$ 542,220	$ 9,683
1982	584.0	15	7	$ 321,893	$ 45,985
1983	568.8	21	23	$ 407,541	$ 17,719
1984	557.6	29	16	$ 222,480	$ 13,905
1985	905.4	22	22	$ 536,912	$ 24,405
1986	1067.1	11	56	$ 823,392	$ 14,703
1987	755.5	13	29	$ 646,239	$ 22,284
1988	608.7	28	19	$ 601,203	$ 31,642
1989	942.7	29	23	$ 409,436	$ 17,802
1990	530.8	38	11	$ 246,907	$ 22,446
1991	1334.0	31	21	$ 494,077	$ 23,527
1992	3766.1	25	31	$ 1,469,563	$ 47,405
1993	574.2	33	19	$ 137,969	$ 7,262
1994	89.0	18	9	$ 28,645	$ 3,183
Average	**894.6**	**27.7**	**23.2**	**$ 484,644**	**$ 24,365**

Sources: Harvest levels, days, and number of vessels from McCullough and Campbell 1995. Values of fishery obtained from Commercial Fisheries Entry Commission facsimile for statewide average prices, received May 10, 1996.

2.8.2 Food and Bait Fishery.

This fishery was open for 10 periods between July 16 and the end of July in 1994. When catcher vessels leave the immediate area of shore-based processing facilities, industry follows with floating processors and tenders. Although the entire Aleutian Islands Management Area is usually open during the season, fishing effort has been concentrated in the vicinity of Unalaska and Akutan Islands due to processing capabilities and herring concentrations. The Dutch Harbor area food and bait herring fisheries are back to 1980's levels after a severe drop in 1990 (table 2-14, figure 2-22).

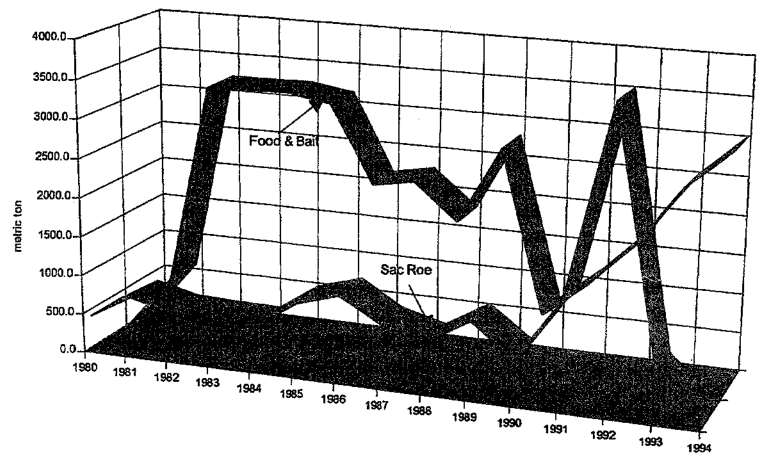
TABLE 2-14.--*Herring food and bait fishery in the Aleutian Islands, catch levels and values, 1980-94*

Year	Food & Bait (metric tons)	Length of Season (Days)	Number of Vessels	Ex-Vessel Value	Average Value per Vessel
1980	0.0		C	$	
1981	638.7	21	C	$ 154,877	
1982	3234.1	39	6	$ 789,987	$ 131,664
1983	3235.9	46	5	$ 788,290	$ 157,658
1984	3245.9	11	5	$ 855,123	$ 171,025
1985	3157.0	26	3	$ 784,375	$ 261,458
1986	2171.8	13	4	$ 663,123	$ 165,781
1987	2270.7	4	9	$ 750,883	$ 83,431
1988	1818.0	21	8	$ 649,282	$ 81,160
1989	2795.0	19	9	$ 961,251	$ 106,806
1990	743.9	<1	7	$ 231,235	$ 33,034
1991	1202.0	<1	8	$ 405,441	$ 50,680
1992	1768.1	5	11	$ 592,483	$ 53,862
1993	2531.0	<1	13	$ 725,384	$ 55,799
1994	3038.1	4	14	$ 1,004,678	$ 71,763
Average	**2123.3**	**19**	**8**	**$ 668,315**	**$ 109,548**

Sources: Harvest levels, days, and number of vessels from McCullough and Campbell 1995. Values of fishery obtained from Commercial Fisheries Entry Commission facsimile for statewide average prices, received May 10, 1996.

2.9 Resource Summary

Resource abundance for groundfish in the Bering Sea and Aleutian Islands region should be relatively stable in the near term. Changing environmental conditions or regulatory actions could significantly alter the composition of stocks pursued by fishers, but the resources are being managed conservatively, and current levels should be sustainable over the near term. Substantial reductions in the guideline harvest levels in the three largest crab fisheries are resulting in vessels from the crab fisheries entering the groundfish fisheries.



Source: McCullough and Campbell 1995.

Figure 2-22.--Aleutian Islands and Alaska Peninsula herring harvests, 1980-94.

Bycatch of Pacific halibut by fishers targeting other species remains a concern and poses challenges for the management of the stock. The current approach is conservative and aims to reduce harvest in order to maintain reproduction levels. The implementation of the Individual Fishing Quota (IFQ) system in 1995 will probably lead to longer seasons and smaller fleets.

Stocks of salmon are very healthy. Uncertainty in the fishery can be attributed to increased harvests and farmed product tending to drive prices downward.

Crab and other shellfish in the Bering Sea/Aleutian Islands region are at depressed levels and not expected to revive in the foreseeable future. The only exception to this is brown king crab, which has seen increased fishing effort in the past few years.

Herring annual harvests are well below previous years' catch levels. Confidence in both the North and South Peninsula harvests of sac roe are only fair. The outlook for Dutch Harbor area food and bait herring fisheries appears to have returned to 1980 harvest levels.

3. MOORAGE DEMAND ANALYSIS

This section describes the current supply of moorage and the existing and projected moorage demand for vessels in Sand Point. The number and sizes of slips at the Sand Point harbor and information on the existing wait list is presented. The demand for exclusive moorage by commercial fishing vessel operators is estimated. Transient moorage demand is also estimated.

3.1 Existing Moorage Capacity

The Corps of Engineers constructed Humboldt Harbor in 1976. The harbor's mooring area consists of 144 slips for vessels up to 65 feet in length, 1,400 feet of floating dock to which transient vessels can side-tie, and 750 feet of steel sheet bulkhead that can also be used to side-tie transient vessels. The harbor has a servicing dock with a 42-by-105-foot working area. Additionally, the city widened and extended the south breakwater and constructed a 62-by-200-foot dock on the seaward side of the breakwater in a water depth of 30 feet at MLLW. The dock provides space for loading and offloading containers and cargo.

The 144 existing permanent slips in Humboldt Harbor are sized entirely for vessels in the salmon seiner class. Permanent moorage is allocated by slip size, as shown in table 3-1.

TABLE 3-1.--*Existing permanent moorage at Sand Point*

Vessel size (ft)	Number of slips
22 - 30	24
31 - 40	54
41 - 50	28
51 – 65	38

3.2 Wait-Listed Vessels

A profile of the commercial wait-listed fleet is presented for informational purposes and is used in estimating moorage demand. Commercial demand for expanded moorage comes from the vessels currently operating in the Sand Point area throughout the fishing season. Tender vessels working in conjunction with the salmon catcher fleet are mainly crabber/trawler class craft that deliver raw product to the shore-based Trident Processing Plant.

Currently, 21 vessels are on the waiting list for permanent moorage in Sand Point. Of these vessels, all are in excess of 80 feet. Initial interviews with fishers, processors, and Sand Point harbor personnel indicate that the tender/crabber class fleet represents the vast majority of vessels requiring moorage, both permanent and transient, at Sand Point. The waiting list verifies this conclusion. Table 3-2 presents characteristics of vessels on Sand Point's waiting list.

TABLE 3-2.--*Vessels on waiting list for permanent moorage at Sand Point*

Length (ft)	Vessels	Percentage
80 - 100	2	10
101 - 125	13	61
126 - 145	4	19
146 - 160	2	10
Total	21	100

Commercial Fisheries Entry Commission (CFEC) records show that approximately one-third of the wait-listed vessels are home-ported in Alaska. The other two-thirds are from the Pacific Northwest, namely Washington and Oregon.

3.3 Transient Moorage Demand

Transient vessels calling at Humboldt Harbor include commercial fishing craft such as tenders, draggers, and large crabbing boats. The fleet participates in a myriad of fisheries throughout the year, including salmon, crab, herring, pollock, halibut and cod.

Sand Point's harbor is currently fully occupied, with substantial transient use. In addition to permanent moorage of 144 slips for salmon seiners, an average of 80 large commercial vessels use the harbor on a transient basis each year. During the extremely busy fall months, up to 50 vessels may seek shelter in Humboldt Harbor in a single day. It should be noted, however, that when skippers call Humboldt's harbormaster to request docking space and are told none is available, the information is quickly circulated around the fleet, so other skippers do not bother calling in. This contributes to underestimating the total number of large transients desiring space at Humboldt Harbor.

The transient fleet uses Sand Point's harbor throughout the year for moorage during closed fishing periods, to obtain essential provisions for fishing operations, for crew rotations, and as a harbor of refuge during the area's frequent and severe storms. The fleet also uses Sand Point as a service center and location for short-term (several days) and long-term (3 to 4 weeks) moorage. Large transient vessels that operate in the area and are turned away from King Cove, Dutch Harbor, or Kodiak due to inadequate moorage space also use Sand Point as an alternate harbor.

Crowded conditions result in vessels being rafted two and three deep in an attempt to provide protected moorage to as many as possible. The harbormaster discourages rafting more than three deep, both to minimize dock and fender piling damage and to maintain maneuverability within the harbor. By rafting, the existing harbor can accommodate approximately 17 large vessels. Subtracting the vessels that currently moor in the existing harbor from the number that use the harbor on a transient basis each year yields a total of 63 (80 - 17 = 63) vessels in excess of 80 feet that desire space at Sand Point's harbor annually.

The demand for transient moorage is determined by subtracting the number of vessels on the wait list for permanent moorage (21) from the existing transient fleet (63). This results in a net demand in Sand Point for approximately 42 slips of transient moorage.

Use of the Sand Point harbor by transient vessels is shown in table 3-3. Humboldt's harbormaster relates that the 1996 use of the harbor by large vessels is representative of the last several years. Complete data for 1997 does not yet exist. However, harbor personnel report that to date, 1997 harbor use patterns have not differed from recent years.

TABLE 3-3.—*Sand Point transient vessel moorage, 1996*

Length	No. of vessels	%	Total days/year
80 - 100	19	23	402
101-125	43	56	977
126-over	18	21	375
Total	80	100	1,754

Source: Sand Point harbormaster.

Figure 3-1 shows the total vessel days per month for 1995 in the Sand Point harbor and the percentage of vessel days in each month. Large transient vessels used the harbor a total of 1,754 vessel days. October through December combined represent almost 50 percent of the total vessel days. During these times, congestion is severe. Although some form of fishing goes on throughout the year, the intense salmon season is over by the end of September, and many of the vessels require long-term dock space so the skipper and crew can go home for the holidays and/or make necessary repairs to their boats.

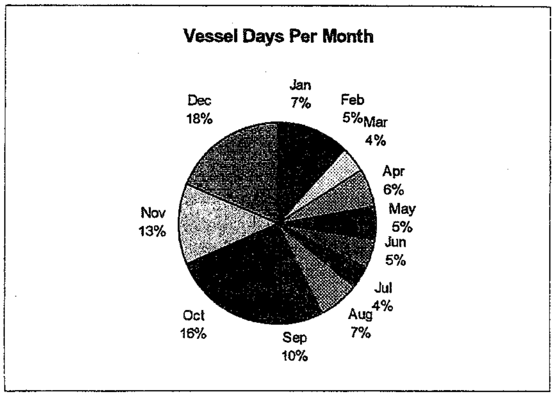


FIGURE 3-1.--Vessel days of harbor use by large transient vessels at Sand Point.

3.4 Commercial Fishing Fleet Projections

No significant increases or decreases are expected in the Sand Point commercial fishing fleet. This is primarily due to healthy stocks, existing or proposed limitations on the number of vessels participating in significant fisheries, and the ability to fully exploit the resources with existing capital.

3.5 Summary of Moorage Demand

The demand for new moorage at Sand Point is composed of 63 commercial fishing vessels, including 21 seeking permanent moorage and 42 seeking transient space.

4. EXISTING CONDITIONS

This section examines commercial fishing activities and modes of operation as they currently exist for the relevant fleet using Humboldt Harbor. Vessel operating costs for the average-sized tender/crabber are defined, opportunity costs of time are calculated for the crew, congestion-related problems within the existing harbor are discussed, and travel to alternate ports by vessels unable to secure moorage at Sand Point is examined.

The existing supply of moorage available in Sand Point is not adequate to meet current demand. Surrounding harbors, including King Cove, Dutch Harbor, and Kodiak, are also operating at or above design capacity. Harbor facilities at Chignik are pending authorization. If constructed as described in the approved feasibility report, the Chignik harbor would accommodate 105 vessels total, only 8 of which would be in excess of 80 feet in length. However, Chignik has a waiting list of its own for the larger slips, which does not overlap vessels vying for space at either Sand Point or King Cove. Humboldt Harbor is overutilized year-round for all but vessel sizes less than 65 feet, though the overcrowding problem is most acute during the fall and winter. Commercial fishing vessels, both local and transient, are severely impacted by congestion and lack of adequate moorage. Expanded harbor space for large transients at Sand Point would allow the operators to avoid running to other Aleutian Island or Pacific Northwest ports during closed fishing periods and off-seasons.

Presently, vessels turned away from Humboldt Harbor make round trips between the Sand Point area and their ultimate moorage alternative, namely King Cove, Dutch Harbor, or Kodiak. King Cove is 156 miles round trip from Sand Point; skippers first try to secure moorage there. King Cove's harbor, however, also has very limited moorage space for large transient craft, and vessels must often travel farther to Dutch Harbor, a 472-mile round trip from Sand Point, or Kodiak, a 720-mile round-trip journey. If space is unavailable at any of these alternate ports, vessels may have to travel to ports in the Pacific Northwest. Although the need for this extended travel occurs relatively infrequently, the trips are very costly both in time and dollars.

4.1 Vessel Operating Costs

The average operating cost of a large transient class vessel (a 110-foot to 125-foot tender or crabber was chosen as typical) operating within the Bering Sea-Aleutian Island management Area (BSAI) is shown in this subsection. Data was obtained from conversations with BSAI fishers and from statistics from the Alaska Department of Fish and Game, Division of Commercial Fisheries Management and Development. This profile summarizes activities for Sand Point area fisheries throughout the year. Gear repair, miscellaneous expenses, insurance, and moorage fees were not considered when computing hourly costs. However, stores (food for crew and miscellaneous) were considered.

The transient fleet spends an average of 285 days participating in a number of fisheries in the Aleutian Island region. Individual items were classified into fixed and variable operating costs. Fixed costs are those that would be incurred by the vessel owner whether or not the boat was put to any productive use. These annual cost items include fixed depreciation and return on investment. Fixed costs were not considered when calculating annual operating costs. Variable costs, for this exercise, are those that occur while the vessel is in operation, including vessel repair and replacement, insurance, maintenance, food and miscellaneous, and the cost of fuel and lubricating oil (including hydraulic oil and similar consumables).

Fuel consumption estimates are based on a Northern Economics survey completed in 1995 in which respondents indicated an average fuel consumption of 50.34 gallons per hour for vessels in this class. Lube oil expenses were estimated as 7 percent of fuel costs. Average daily costs were found by spreading the total costs over the total number of operating days, 285. Hourly costs were found by dividing daily operating costs by 24 hours.

Annual variable operating costs are as follows:

Maintenance	$75,400
Stores	99,200
Total	$174,600

The hourly operating cost for maintenance and stores would be $25, or ($174,600/285)/24.

Added to this is the hourly fuel component of $55, based on a fuel consumption rate of 50.34 gallons per hour and an average fuel cost of $1.10 per gallon. The total hourly operating cost is $80 ($25 + $55).

4.2 Opportunity Cost of Time

Travel of any kind imposes costs on the fleet. These costs include additional operating expenses for the vessel as well as the crew's opportunity costs. The larger craft carry an average of four crewmembers per vessel, plus the skipper. Crewmembers incur an opportunity cost of time (OCT) associated with down time. OCT is the value of work or leisure activities forgone because of having to spend hours traveling from Sand Point to alternate harbors in an attempt to secure moorage space. The opportunity cost premise is based on the concept that the more time a vessel's crew is required to spend away from town searching for moorage space, the more valuable space at Sand Point becomes. Operating costs measure the direct out-of-pocket expenses associated with searching for harbor space, while the opportunity cost measures the time forgone by a vessel's crew.

For OCT calculations, a value of next best use of time has been assigned. For this report, the OCT has been given a minimum, or leisure time, value. According to Engineering Regulation (ER) 1105-2-100, in lieu of a project-specific estimate of the opportunity cost of leisure time, a value equal to one-third the wage rate is used. Based on a survey performed by Northern Economics in association with ResourcEcon entitled Opportunity Cost of Time for Fishers, one-third the hourly wage rate for fishers in this category is $14.67, say $15.00. This figure is used in opportunity cost of time calculations.

Lack of sufficient moorage space in the Sand Point harbor leads to a variety of difficulties. Vessels must raft together, as described earlier; endure delays when attempting to leave the harbor due to congestion; and damage each other as well as the docks. Also, many vessels must travel to other ports in search of protected moorage. Costs associated with both rafting of vessels and traveling to alternate ports have been computed and are presented in the following paragraphs.

4.3 Expenses Under Existing Conditions

4.3.1 Expenses Related to Rafting.

For this analysis, expenses associated with severe congestion leading to rafting at Sand Point are briefly discussed. However, since demand will continue to exceed capacity during peak-use times with both alternatives explored, congestion-related expenses are likely to continue to accrue to some extent. A project would alleviate some of the problems due to congestion, and therefore limited benefits have been claimed.

Rafting of vessels, especially large vessels, places considerable strain on the docks and pilings at the existing harbor. The docks at Sand Point are floating, which allows more potential damage. An average of $19,000 is spent annually for dock and fender piling repairs, inclusive of mobilization and demobilization costs to the remote community. A portion of this amount is due to normal wear and tear not related to the practice of rafting. Harbor personnel estimate that rafting contributes to roughly 35 percent, or nearly $7,000, of the annual repair/replacement costs. A portion of this amount would be eliminated with construction of additional moorage facilities.

Rafting also results in damages to vessels. Boats are subject to minor collisions with other craft and bumping against the dock, causing scratches and damages to rails, guards, hardwood, etc. According to harbor personnel, approximately 36 vessels rafted in Humboldt Harbor sustain an average of $2,500 each, or a total of $90,000, in damages annually as a result of rafting. This amount would be reduced if rafting practices were diminished.

4.3.2 Travel-Related Expenses.

During October through December, approximately 55 individual vessels larger than 80 feet are turned away each year from Humboldt Harbor due to lack of adequate moorage space. The majority of these vessels make the round trip from Sand Point to King Cove, Dutch Harbor, or Kodiak each time. According to local fishers and harbor personnel at each location, approximately 25 vessels, or 45 percent, are able to obtain moorage in King Cove; 18, or 33 percent, in Dutch Harbor, and 12, or 22 percent, in Kodiak. Operators report they make these round trips an average of 3 times per year. Travel to King Cove is 156 miles round trip and takes approximately 16 hours; travel to Dutch Harbor is a 472-mile round-trip journey and takes 47 hours; and Kodiak is 720 miles round trip and takes approximately 70 hours. Operating costs and OCT expenses have been calculated and are shown below.

Local Travel.

King Cove.

25 vsl x 3 round trips x 16 h/trip x \$80/h op cost	=	\$96,000
25 vsl x 3 round trips x 16 h/trip x \$15/h OCT x 5 crew	=	90,000
Total		\$186,000

Dutch Harbor.

18 vsl x 3 round trips x 47 h/trip x \$80/h op cost	=	\$203,000
18 vsl x 3 round trips x 47 h/trip x \$15/h OCT x 5 crew	=	190,000
Total		\$393,000

Kodiak.

12 vsl x 3 round trips x 70 h/trip x \$80/h op cost	=	\$202,000
12 vsl x 3 round trips x 70 h/trip x \$15/h OCT x 5 crew		189,000
Total		\$391,000

Total annual local travel expense	\$970,000

Pacific Northwest Travel. As previously stated, vessels unable to secure moorage locally must occasionally travel to ports in the Pacific Northwest. Travel to Pacific Northwest ports is also periodically necessary for vessel maintenance and repair. A telephone survey of 20 BSAI tender/crabber operators who moored in the Sand Point harbor during 1996 was conducted to determine how many of these journeys were made as a direct result of inadequate moorage space and how many were attributable to maintenance/repair. An average of 22 of the transient fleet make one round trip per vessel per year to the Pacific Northwest between fishing periods because sufficient moorage is unavailable in the BSAI area. These Pacific Northwest trips are exclusive of, and in addition to, travel to local alternative ports. Not all of the standard five crew members normally on board make these extended journeys. Skippers report it is usual for 3 crew, inclusive of the skipper, to make the trip. Expenses for this travel are as follows:

22 vsl x 1 round trip x 343 h/trip x $80/h op cost	=	$604,000
22 vsl x 1 round trip x 343 h/trip x 3 crew x $15/h OCT	=	334,000
Total		$938,000
Total travel-related expenses		$1,908,000

*4.3.3 **Summary.***

Annual expenses under existing conditions are summarized as follows:

Rafting and congestion-related expenses	$97,000
Travel-related expenses	1,908,000
Total	**$2,005,000**

5. ALTERNATIVES INVESTIGATED

Two alternatives were considered in detail for expanding the harbor capacity at Sand Point. A harbor size optimization revealed that moorage for 37 vessels was the point at which annual benefits per vessel just exceeded annual costs per vessel.

5.1 Alternative 1

With this alternative, a mooring basin would be constructed adjacent to and south of the existing harbor. It would incorporate the southern breakwater and causeway to the city dock by extending the existing breakwater to form a basin for mooring the design fleet. An additional breakwater would be constructed south of the newly formed basin to provide protection from incoming waves from the south to west-southwest. The positioning of the breakwaters would create an entrance channel alignment allowing access from the west to northwest. A plan view of alternative 1 is in figure 5, main report.

5.2 Alternative 2

Alternative 2 would also have a mooring basin adjacent to the south of the existing harbor. It would incorporate the southern breakwater and causeway to the city dock by extending the existing breakwater to form a basin for mooring the design fleet. An additional breakwater would be constructed to the south of the newly formed basin to provide protection from incoming waves from the south to the west-southwest. Unlike alternative 1, the positioning of the breakwaters would create an entrance channel alignment allowing access from the southwest. A plan view is in figure 7, main report.

6. WITHOUT-PROJECT CONDITION

This section contains general information on present conditions in Sand Point due to insufficient moorage space. Inadequate moorage for large vessels causes increased maintenance and repair requirements for vessels and facilities, requires vessels to be shuffled about the mooring area, requires operators to take special precautions during storms, and causes operators to move their boats to distant harbors for the off-season and closed fishing periods. These activities take time and labor and raise operating costs, causing operators to incur additional expenses, thereby reducing net incomes.

Damage to both vessels and facilities in Sand Point due to rafting are significant. When one boat needs to move, vessels to the outside have to be untied and then the raft reassembled. This requires the time and effort of several crews. Because rafted boats extend into common maneuvering areas, congestion results in delays for the transients as well as for other harbor users. All of these problems cause increased operating costs and loss of time for the vessels' crews.

Using the data available, the number of vessels in the Sand Point commercial fishing fleet is projected to remain at current levels over the 50-year period of analysis. Although there will be minor increases and decreases as marginal operators move in and out of the industry, the overall trend is for no significant increase or decrease. Therefore, conditions are likely to remain the same. The harbor will face continued problems associated with overcrowded conditions. Vessels and mooring facilities will continue to sustain damage due to the overcrowding. The high demand for space will continue to impact efficiency of operations within the harbor.

7. PROJECT BENEFITS

This section provides the analysis of the total potential economic benefits that could be realized with expanded moorage facilities at Sand Point. Only those categories of benefits that can be assigned tangible monetary values directly resulting from harbor development are included. Information supporting the benefits claimed in this report was obtained during public meetings, visits to Sand Point, followup telephone conversations, and by review of statistics from the resource and fisheries management agencies. Telephone and personal interviewing was chosen rather than written surveys as the primary information-gathering tool where secondary data sources were not available. Commercial fishers are difficult to contact and tend not to have much time for preparing detailed responses necessary for written surveys. The success of any survey depends on the cooperation of those being questioned. Commercial fishers are an independent bunch. While interviewing may lack strict statistical accuracy, it does provide flexibility in data gathering, allowing better contact rates than surveys and a more relaxed, informative atmosphere.

Justification for a proposed action is determined by comparing average annual equivalent costs – including project first costs, interest during construction, and operating and maintenance expenses – with an estimate of the average annual benefits to be derived from the project. Benefits and costs are made comparable to an equivalent time value of money by application of an appropriate interest. The interest rate used in this analysis is 7-1/8 percent, and a 50-year project life is assumed. Estimated costs and benefits have been made to reflect October 1997 price levels. This section provides the analysis of the total potential economic benefits that could be realized with additional moorage space at Sand Point. Methods used to derive benefits are described, sources of data are cited, and sample calculations are displayed.

7.1 NED Benefits for Alternatives 1 and 2

Since both alternatives would provide moorage for 37 vessels up to 150 feet in length, annual savings would be the same. The alternatives would supply protected moorage for the majority of vessels currently on the waiting list for permanent space. However, demand would continue to exceed capacity in Humboldt Harbor during peak use months. With 37 additional slips, 26 large vessels (63 - 37 = 26) would continue to seek shelter in distant ports. Annual costs associated with alternatives 1 and 2 are presented below.

7.1.1 Rafting-Related Benefits.

Dock & Piling Damage. Currently, an average of $19,000 is spent each year to repair and/or replace damaged pilings. Of this amount, harbor personnel estimate that $7,000 is attributed to the additional strain caused by rafting practices. Continual rafting decreases the useful life of docks and pilings. The difference in the annual capital cost between the with-project and without-project conditions represents the benefit. Bearing in mind that some rafting would continue under the with-project scenario, and assuming the with-project condition would alleviate 40 percent of current maintenance/replacement costs attributable to rafting (a conservative figure, according to the harbormaster), nearly $3,000 would be saved annually.

Vessel Damage. Problems associated with vessel damage due to rafting include:

a. Dissimilar vessels tying together, such as large to small or steel to fiberglass, which can cause damage to either or both vessels.

b. Loss or lack of bumpers between vessels. This can create extensive damage to fiberglass and wooden vessels by the harmonic movement of the boats in the water. This is particularly noticeable with vessels of different sizes or design that have unequal pitch and roll cycles.

Currently, $90,000 in vessel damages is incurred annually because of rafting. Assuming the same with-project percentage of damage reduction as with dock and piling repairs (40 percent), $36,000 in damages would be avoided each year.

The total rafting-related benefits would amount to **$39,000** annually.

7.1.2 Travel-Related Benefits.

To find protected space, operators currently seek moorage at King Cove, Dutch Harbor, Kodiak, and occasionally ports in the Pacific Northwest. An average of 25 vessels secure space in King Cove's small harbor each year, 18 find moorage in Dutch Harbor, and 12 moor in Kodiak. Twenty-two large vessels must travel to Pacific Northwest locations. The need to travel to the Pacific Northwest due to lack of adequate moorage space would probably be eliminated. Telephone conversations with BSAI fishers and harbormasters at both King Cove and Dutch Harbor reinforce this assumption. It is likely the ratio of vessels traveling to alternate local ports would remain the same. Costs associated with both alternatives for travel-related expenses would be as follows:

Local Travel.

King Cove.

25 vsl x 3 round trips x 16 h/trip x $80/h op cost	=	$96,000
25 vsl x 3 round trips x 16 h/trip x $15/h OCT x 5 crew	=	90,000
Total		$186,000

Dutch Harbor.

1 vsl x 3 round trips x 47 h/trip x $80/h op cost	=	$11,000
1 vsl x 3 round trips x 47 h/trip x $15/h OCT x 5 crew	=	11,000
Total		$22,000

Total annual local travel expense $208,000

Pacific Northwest Travel. At present, $938,000 is spent annually by fishers traveling to Pacific Northwest ports. With either alternative, this out-of-State travel due to lack of adequate moorage in local ports would be eliminated.

Total travel-related costs: $208,000

Annual travel savings:

Existing condition travel-related expenses	$1,908,000
Saved with either alternative	-208,000
Annual travel savings	**$1,700,000**

7.1.3 ***Summary.***

Annual savings for both alternatives would include $1,700,000 in travel savings plus $39,000 in congestion-related benefits, for a total of $1,739,000.

7.2 Regional Benefits

From its beginning, the community of Sand Point has recognized that diversification and flexibility are essential to its success. Many residents migrated to Sand Point from smaller communities in the region, such as Unga, Sanak, Morzhovoi, Belkofski, and other communities that no longer exist. The people who moved to Sand Point recognized the need to centralize in a larger community where they could more actively pursue commercial fishing as the cornerstone of their economy. Ultimately, how the community fares in the future will depend on how it continues to adapt to changes in the fisheries resource and other factors that affect the commercial fishing industry.

In addition to serving as the base for the local fishing fleet, the community is a frequent stopover for groundfish and crab vessels transiting to and from other ports to fishing grounds in the Bering Sea to take on supplies, conduct repairs, or participate in fisheries in the region. Trident Seafoods, a major seafood processing company, has a plant in Sand Point, processing salmon, halibut, Pacific cod, pollock, and other species. Another processing company, Peter Pan Seafoods, has a facility near the Sand Point airport that provides administrative support to their operations.

Sand Point's fishing industry developed strongly through most of the 1980's and early 1990's, in spite of some difficulties in the salmon industry and the loss of fisheries (such as shrimp in the late 1970's and crab in the late 1980's). As figure 7-1 shows, harvest values by species for vessels home-ported in Sand Point were relatively steady from 1980 to 1995. However, in 1996 the Alaska Peninsula salmon fishery virtually collapsed. In 1995, the value of salmon caught in Alaska Department of Fish and Game Area M was $51,247,508. In 1996 the value for salmon in area M dropped to $18,579,000, a 64-percent drop from the previous year. The decline in value was due to the combination of extremely poor salmon returns and very low ex-vessel prices for salmon paid to fishermen.

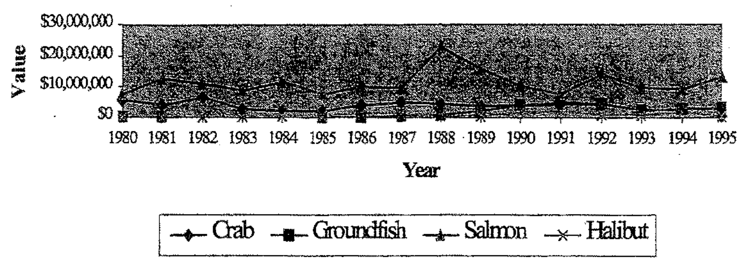


Figure 7-1.—Harvest values by species for vessels home-ported in Sand Point, 1980-1995.

The salmon industry in all areas of Alaska is in a period of change. Peak prices paid to fishermen were reached in 1988, but in 1989 the prices began a declining trend which continues today. Changes in the world supply of salmon are probably the largest determinant in this trend. As growth in the farm salmon industry continues, there is no reason to anticipate a shift in the near-term or even long-term future. With the international markets awash in farm and wild salmon, prices paid to fishermen are less sensitive to changes in local harvest. Prior to the large infusion of farmed salmon which began in the mid-1980's, prices were more likely to reflect changes in the Alaska harvest levels. Today prices are more likely to reflect the total world supply of salmon, both farm and wild. Under the current market conditions, communities like Sand Point are much more sensitive to drastic reductions in returning salmon.

Historically, Sand Point has had the largest fishing fleet of the eastern Aleutian communities, and of those vessels, nearly all were salmon vessels 58 feet or less. Most Sand Point fishermen depend on the salmon fishery as their primary activity. However, they are always looking to other potential fisheries as a secondary source of income. Secondary fisheries have included halibut, crab, and groundfish. The ability of resident fishermen to diversify into other fisheries, however, is being curtailed somewhat due to the lack of permanent moorage space in the local harbor.

Currently, Sand Point does not have the facilities to permanently moor vessels more than 65 feet in length. There are 144 permanent slips for vessels under 65 feet in length and space for approximately 17 transient vessels, depending on how they are rafted. With no permanent mooring space available for vessels over 65 feet, nearly all the larger vessels must use transient moorage space. In many cases, the demand for moorage space exceeds the available supply, and large vessels must seek moorage at King Cove, Dutch Harbor, or Kodiak. When surveyed, local fishermen and the Sand Point harbormaster reported that during peak demand, approximately 50 transient vessels seek temporary moorage spaces.

Expanding the harbor facilities in Sand Point to accommodate vessels more than 65 feet in length would have numerous positive impacts on the community, including:

- Increased moorage and sales tax revenue from additional slips;
- Direct impacts to local businesses and city government from increased demand for goods and services and tax revenue generated from purchases of fuel and other goods;
- Increased opportunity for local residents to purchase larger vessels;
- Increased potential for capturing the last load of groundfish associated with CDQ fisheries in order to generate wage and earning profits and revenue from raw fish tax;
- Aid in attracting a new shore-based processing plant to Sand Point to increase employment opportunities and revenue to the city and borough from raw fish tax; and

- Avoidance of unnecessary expenditures associated with refurbishing the old dock pilings.

These potential benefits to the community are discussed in the following paragraphs.

7.2.1 Increased Moorage and Sales Tax Revenues.

Expanding the mooring capacity of the Sand Point boat harbor would bring an immediate benefit to the community from an increase in revenue from moorage fees. With expansion of the harbor to include vessels ranging from 80 to 165 feet in length, revenues from fees collected would in all likelihood increase. To estimate of future revenue collected from moorage fees, the Sand Point daily use fee and data from a fleet survey conducted by ResourcEcon and Northern Economics in 1997 were used. The current fee structure for daily use at the Sand Point harbor is outlined in table 7-1.

TABLE 7-1.—*Sand Point daily moorage rates*

Vessel Size (ft)	Rates
under 20	$7.00
21 to 31	$10.00
32 to 46	$15.00
47 to 60	$20.00
61 to 75	$25.00
76 to 90	$30.00
91 to 105	$40.00
106 to 125	$50.00
126 to 150	$60.00
151 and over	$70.00

Source: Sand Point harbormaster, July 1997.

To determine moorage space revenue, some indication of demand by vessel size is needed. In June 1997, ResourcEcon and Northern Economics completed a survey of the Bering Sea fishing fleet for the Corps of Engineers and the North Pacific Fishery Management Council which showed the average vessel length for the crab fleet was 115 feet. Using these estimates, vessels most likely to use the expanded moorage space at the Sand Point harbor facility would range between 90 to 125 feet in length. Assuming the new slips would be used 75 percent of the year and that 15 vessels would range in length from 91 to 105 feet and the remaining 14 vessels would range from 106 to 125 feet, the estimated additional revenue collected from user fees would be $369,563. The increased revenue from moorage fees could be used for maintenance and improvements for the harbor.

7.2.2 Direct Impacts to Local Businesses.

A direct benefit to the community of Sand Point as a result of expanding the harbor would come from purchases of goods and services from local businesses resulting from harbor expansion. There is a direct relationship between the number of vessels moored in a harbor and the demand for goods and services associated with repairing and maintaining those vessels. As the number of vessels moored at Sand Point increases, the demand for goods and services needed to repair and maintain these vessels will increase. This increase in demand of goods and services to accommodate these new vessels would in all likelihood spur some growth in the economy in addition to generating city revenue from sales tax.

To determine the extent of the impacts to the local businesses, vessel cost data from a 1997 fleet survey of Bering Sea fishing vessels was used (Northern Economics and ResourcEcon, 1997). Historically, users of the transient facilities have been tender vessels that participate in the salmon fisheries in the summer and crab fisheries in the winter. Those vessels most likely to seek permanent moorage space in the expanded Sand Point harbor would be tender/pot vessels ranging from 80 to 125 feet in length. Pot vessels under 100 feet spend approximately $34,716 annually on fuel, lube oil, and hydraulic supplies; $66,203 on maintenance of the vessel; and $32,336 for repairs to fishing gear. For pot vessels between 101 and 130 feet, the cost associated with fuel/lube oil/ hydraulic supplies was $57,217, vessel maintenance was $113,623, and fishing gear repairs was $28,316.

TABLE 7-2.—*Crabber (pot vessel) operating cost profile*

	Length overall (ft)			
Expense	**<100**	**101-130**	**131-160**	**>160**
Fuel/lube oil/hydraulic	$34,716	$57,217	$87,854	$107,442
Vessel/machinery maintenance	$66,203	$113,623	$204,029	$278,890
Fishing gear maintenance & repair	$32,336	$36,309	$41,718	$45,176
Bait	$15,722	$23,627	$34,390	$41,272
Food	$11,273	$14,117	$17,989	$20,465
Other stores and supplies	$3,486	$11,737	$61,305	$176,400
Moorage/storage	$6,741	$10,012	$14,466	$17,314
Crew costs:				
Crew share	$261,138	$410,571	$670,435	$871,102
Crew salary & benefits	$46,442	$53,506	$63,125	$69,275

Source: Fleet survey project prepared by ResourcEcon and Northern Economics, June 1997.

As noted above, the expansion of the harbor would result in the addition of 18 new vessels using the mooring facility. Assuming that half of the expenses associated with repairing and operating pot vessels (table 7-2) were spent in the local economy, and that half of the 18 vessels had a length between 85 to 100 feet and the other half between 101 to 125 feet, potential purchases of goods and services from the local businesses would be as listed in table 7-3.

TABLE 7-3.—*Potential added purchases of goods and services from Sand Point businesses*

Potential revenue	Vessel length overall (ft) <100	101-130
Fuel/lube oil/hydraulic	$156,222	$ 257,476
Vessel/machinery maintenance	$297,914	$ 511,304
Fishing gear maintenance & repair	$145,512	$163,391
Sales tax revenue at 2%	$11,999	$18,643

Source: ResourcEcon 1997, from table 2.

Using the Sand Point Business Directory, a list of those businesses associated with repairing and maintaining fishing vessels was completed. Businesses noted below would receive the largest share of purchases of goods and services and thus the greatest impact as a result of expanding the harbor.

- Aleutian Commercial Company
- Bravo Boat Repair
- D&B Service
- Karpa Machine Shop
- Harris Repair
- Midnight Enterprise
- Sand Point Hardware
- Sand Point Mechanic & Welding Service
- Sand Point Electric, Inc.
- Trident Seafoods Corporation
- Peter Pan Seafoods

Expansion of the permanent moorage space in the Sand Point harbor would also have an impact on other businesses not associated with the operation and repairing of the vessels. Some of these impacts are purchases of goods and services by crewmembers relaxing while in port and purchase of bait for pot vessels. Food and supplies are largely bought in bulk from Anchorage or Seattle businesses, so these are not included in Sand Point regional impacts. Crewmembers while moored at Sand Point often frequent local restaurants, motels, and taverns for enjoyment and relaxation. Assuming crewmembers would spend approximately 2 percent of their earnings in the local economy for enjoyment and relaxation, direct purchases from the local businesses would be approximately $138,897. The revenue generated from a 2-percent sales tax on $138,897 in purchases would be $2,778. Other expenses would include bait for crab pots. As noted earlier, many of the additional vessels would most likely be tender/pot vessels. Assuming that all 18 additional vessels would participate in the crab fisheries and half of the bait purchased would be from Sand Point, total expenditures and tax revenue would be $177,071 and $3,541, respectively.

Using Sand Point Business Directory, local businesses most affected by the purchase of food, supplies, entertainment, and bait from the addition of 18 new vessels would be as follows:

- Bayview Restaurant
- Anchor Inn Motel
- City Cab
- Equinox
- Geneva Woods Pharmacy, Inc.
- Reeve Aleutian Airways
- Sand Point Air
- Mae's
- Sand Point Tavern
- Ship's Anchor Restaurant
- Village Green Service
- Village Green Grocery Store

Another indirect benefit from the expansion of the harbor would be the employment of local residents. Bob Golovin, harbormaster, stated that the expansion would generate the need for at least one additional worker to assist in day-to-day operation and maintenance of the larger facility.

In all, expansion of the Sand Point harbor could result in direct purchases of more than $1.8 million for goods and services from local business and $37,000 in annual revenue from a 2-percent sales tax. The injection of more than $1.8 million into the local businesses and $37,000 into the city government would expand the local economy. Businesses and households directly impacted from purchases of goods and services to support the additional vessels would in turn indirectly spend additional money in the local economy. This type of spending is known as indirect effect or induced effect. These effects would continue to cycle through the local economy. Combined with direct impacts, indirect and induced impacts would contribute to the overall growth of the local economy.

7.2.3 Increased Opportunity for Local Fleet Development.

One way resident fishermen could utilize the expanded moorage capacity and ultimately impact the community by diversifying the local economy would be to purchase larger vessels to target a wider variety of fisheries. Salmon has been the primary fishery for Sand Point residents, while the groundfish and crab fisheries have played a more modest role. One reason resident fishermen have concentrated so heavily on the salmon fishery is because of the physical limits of the Sand Point harbor. Currently, the harbor can accommodate only vessels under 65 feet in length. For the most part, vessels under 65 feet in length are limited to coastal salmon and groundfish fisheries due to economics and safety. Offshore fisheries tend to be less cost-effective for vessels under 65 feet due to the hold capacity of the vessels versus the cost and time required to travel to and from the fishing grounds. In addition, smaller vessels are more sensitive to extreme weather conditions offshore and thus are less reliable in offshore fisheries. Expanding the harbor's moorage capacity to accommodate the larger vessels would provide Sand Point residents the opportunity to moor vessels that could potentially target lucrative groundfish and crab fisheries in the Bering Sea.

Another related benefit to the residents of Sand Point would come from increasing the opportunities for young people to become crewmembers on larger vessels. Most new crewmembers are hired directly off the dock, so if more crab and combination/trawl vessels moor in Sand Point as a result of the harbor expansion, there would be more crew opportunities for young fishermen.

7.2.4 Capturing Groundfish Resources.

Each year Sand Point loses the opportunity to process several large vessel loads of groundfish. As the closure of the CDQ fisheries approaches, many of the groundfish, halibut, and sablefish fishermen store their catch until they return to home port in the Pacific Northwest (Washington and Oregon). Because this groundfish is diverted from local ports like Sand Point to ports in the Pacific Northwest, Sand Point and the Aleutians East Borough are losing potential wages, earnings, and tax revenue. Currently Sand Point has a 2-percent raw fish tax and a 2-percent sales tax, while the borough has a 2-percent raw fish tax. One reason that groundfish vessels retain their last harvest load is the lack of harbor accommodations in Sand Point. As noted above, the harbor does not have permanent moorage space for vessels more than 65 feet in length. This restriction on the moorage capacity in Sand Point means that vessels home-ported in the Pacific Northwest go back at the end of the season without unloading their final seasonal catch. With expanded moorage for vessels between 80 and 165 feet, the harbor would be able to accommodate these larger vessels that now return to the Pacific Northwest upon closure of the CDQ fisheries. In turn, tax revenue and valuable employment revenue from wages and earnings associated with processing groundfish catch would be injected into the Sand Point and Aleutians East Borough economy.

7.2.5 Development of Sand Point's Processing Sector.

Diversification of the Sand Point economy is crucial to the overall prosperity of the community, and over the decades, Sand Point has recognized this. Sand Point for years has encouraged business development in the community. Recently, the community has been seeking a business to locate a year-round multi-species fish processing facility on the shore or semi-permanently moored in the harbor. Crucial to the success of this fish processing plant would be adequate moorage space for vessels supplying catch to the plant. However, with Sand Point's current limit on permanent moorage space, the potential for a new groundfish processing plant is limited. Nearly all of the vessels permanently moored in Sand Point concentrate mostly on salmon, with some minor targeting of groundfish and crab. With the Sand Point fleet skewed toward salmon, a new multi-fish processing plant could potentially be at risk of failure. Expanding the harbor to include permanent moorage space for vessels ranging in length from 80 to 165 feet would increase the potential groundfish and crab delivery capacity of the Sand Point fleet. This in turn would provide some much-needed diversification to the Sand Point fleet and offer a more consistent flow of groundfish and crab product to any new processing plant.

7.2.6 Avoiding Unnecessary Harbor Expenses.

Historically, Sand Point transient moorage space has been in high demand. In years past, vessels have been rafted as many as three deep during peak fishing periods. Rafting of vessels at this level often results in damage to the vessel and damage to dock structures and fender pilings. When asked about damage to the harbor in a recent survey, the harbormaster reported that the Sand Point harbor facility, on average, replaces 5 pilings from the transient dock per year. He stated that the transient dock pilings are made of wood and thus are not designed to withstand the stress caused by excessive rafting. He also stated that in addition to yearly damage to pilings, excessive rafting and swells have caused damage to the concrete "A" float. The harbormaster explained that the transient dock was originally designed for 20 to 24 transient vessels, and that 21 years of constant stress and pressure from overuse has begun to threaten the usability of the transient dock. Without the expansion of permanent mooring facilities to remove some of the pressure from the transient dock, the entire "A" float will need replacing soon.

8. SENSITIVITY ANALYSIS

The intent of this analysis is to test the sensitivity of project justification and scoping to changes in the major variables used in computing project benefits, namely the frequency and number of vessels traveling to Pacific Northwest ports and harbor-of-refuge benefits. By examining likely ranges of values of these variables, this sensitivity analysis demonstrates the supportability of the economic justification of the recommended plan.

8.1 Travel to Pacific Northwest Ports

Under existing conditions, annual benefits for Pacific Northwest travel total $938,000. If these benefits were reduced by 50 percent, yearly savings for this category would decline to $469,000. This would result in total annual benefits of $1,270,000 ($1,739,000 - $469,000). The benefit-to-cost ratio would still be positive at 1.5 and net benefits would accrue at $393,000 annually.

8.2 Harbor of Refuge

Harbor-of-refuge benefits for this project represent an area of unclaimed benefits that have not been quantified. A brief discussion follows.

The impact on National Economic Development (NED) of increased harbor-of-refuge opportunities would be more days available for vessels to take refuge in the harbor during severe weather. Harbor-of-refuge benefits represent protection from risk of damage to which the fleet would otherwise be exposed.

Fishing vessel safety is a significant concern in Alaska and on the West Coast in general. The Pacific States Marine Fisheries Commission, in cooperation with the National Research Council Committee on Fishing Vessel Safety, produced a lengthy report on West Coast vessel safety (Jacobson, Goblirsch, and Van Noy). The study drew from several data sources, including the NMFS vessel operating units data base, the Pacific Fisheries Information Network data base, U.S. Coast Guard casualty data, Washington Department of Health occupational mortality data, and interviews with fishers. Data cited in the report was used to estimate historical annual weather-related losses among vessels larger than 79 feet. Weather-related loss events include capsizing, flooding, foundering, sinking, and disappearance, which make about 51 percent of losses from all sources.

Data from the West Coast vessel safety study cited previously was used to estimate historical annual weather-related losses in the vessel class over 79 feet. Weather-related loss events include capsizing, flooding, foundering, sinking, and disappearance, which make up about 51 percent of losses from all sources. Average annual weather-related losses during the 1982-87 period for which data was presented were $5.2 million, unadjusted for price-level effects on replacement costs.

The $5.2-million annual loss is equivalent to a fleet daily loss of $14,200 using a 365-day year, or $22,800 using the 228 average days in which the fleet is actively fishing. The study identified 41 vessels in the size category, which has a sample error indicating the number could be as high as 84. The range of expected loss per vessel day is therefore $14,200/84 = $170 at the low end of vessel cost, to $22,200/41 = $541 at the high end. The high-end data is more realistic, since none of the fleet fish 365 days per year, and there is a high confidence level in the vessel data base because the data is able to account for 99 percent of the samples.

The expected weather-related loss associated with a vessel year is $5.2 million/41 vessels = $126,800. The proposed project would reduce vessel risk exposure by approximately 1.5 vessel years, so $126,800 × 1.5 = $190,200. Adjusting the basic loss data for price level effects on replacement costs, the $190,000 becomes $285,000 in 1996 prices.

Another approach to harbor-of-refuge benefits would be to estimate indemnity differentials. Interviews with representatives of three insurance companies underwriting both marine and commercial insurance yielded a 'rule-of-thumb' approach that would allow comparison of risk associated with casualty loss of a large trawler at sea against risk associated with casualty loss of an equivalent commercial activity without the ocean-related risks. The activity selected was a modern fish processing plant in a tilt-up concrete structure, with up-to-date fire protection systems. The rationale is that when a vessel is in a protected harbor, it is removed from the risk associated with hazards of the sea, and more than half of the factors contributing to casualty loss are no longer present. The risk environment becomes non-typical of the high-seas trawler operation. The comparative risk is displayed in table 8-1.

The proposed Sand Point harbor improvement project results in an estimated 1.5 vessel years' reduction in weather-related risk exposure. Using a quantified risk differential ranging from $67,500 to $77,500 per vessel year, the estimated harbor of refuge benefits are $101,200 to $116,200. The benefit is a function of the value of the vessels expected to be using the harbor. The benefits claimed are consistent with the premise that the harbor expansion would serve the larger, more costly vessels in the fleet. A major shipyard was contacted to estimate vessel values, and indicated that high-end, new 120-foot vessels cost about $9 million, and high-end, new 150-foot vessels cost approximately $12 million.

TABLE 8-1.--*Comparative indemnity: fishing trawler and seafood processing plant*

Item	Trawler (worth \$3-\$6 million)	Processing plant (worth \$3-\$6 million)
General liability	Hull & machinery @2%, so \$60,000-\$120,000	\$10,000-\$15,000 per \$3 million, so \$10,000-\$30,000
Machinery	Included	\$5,000 per \$500,000 (for \$3.5-million value, \$500,000)
Workers' compensation	\$7,500 per person	@10% - \$3,000 per person
Vehicles	A personal equivalent expense	\$1,000 ea (not included)
TOTALS:	Low end: \$60,000 + \$37,500 = \$97,500 High end: \$120,000 + \$37,500 = \$157,500	Low end: \$10,000 + \$5,000 + \$15,000 = \$30,000 High end: \$30,000 + \$35,000 + \$15,000 = \$80,000
Range of differences:	Low end: \$97,500 - \$30,000 = \$67,500 High end: \$157,500 - \$80,000 = \$77,500	

The indemnity approach would seem to underestimate benefits, since it does not fully account for these factors:

a. Peak use is during the three-month period of October through December, which accounts for almost 50 percent of vessel moorage days.

b. The October-December period also accounts for more than a third of the weather-related vessel losses.

c. The cost of replacing lost vessels in the fleet with new vessels is high. The harbor would be providing refuge during the highest-risk part of the year, during which the expected losses on a daily basis are greater than estimated above.

REFERENCES

Alaska Department of Commerce and Economic Development. Revised June 1995. *Alaska Seafood Industry.*

Alaska Department of Fish and Game (ADF&G). 1994. "Alaska Peninsula and Aleutian Islands annual salmon management reports."

ADF&G. 1996 (Feb). "The commercial king and tanner crab fisheries in the Bering Sea Management Area," and "The commercial king and tanner crab fisheries in the Aleutian Islands Management Areas," prepared for the Alaska Board of Fish.

International Pacific Halibut Commission (IPHC). 1995 (Aug 23). "Preliminary 1995 stock assessment and fishery evaluation (SAFE) for the Pacific halibut resource of the Bering Sea and northeast Pacific Ocean."

Jacobson, Robert, Goblirsch, Ginny, and Van Noy, Fred. (1990?). "West Coast commercial fishing vessel safety assessment," National Research Council and Pacific States Marine Fisheries Commission.

Knapp, Gunnar and Smith, Terrence. 1991 (May). *The Alaska Seafood Industry.* Prepared for Alaska Industrial Development and Export Authority and Alaska Department of Commerce and Economic Development.

Lowe, Sandra A. 1995 (Sep). "Preliminary stock assessment and fishery evaluation report for the groundfish resources of the Bering Sea/Aleutian Islands region as projected for 1996 - Atka mackerel," NPFMC.

McCullough, James N. and Campbell, Rodney D. 1995 (Jan). "Alaska Peninsula and Aleutian Islands Management Areas sac roe herring report and the Aleutian Islands Management Area food and bait herring report, 1994," ADF&G Regional Information Report No. 4K95-2.

McCullough, James N. *et al.* 1995 (Nov). "South Peninsula annual salmon management report, 1994," ADF&G Regional Information Report No. 4K95-46.

Morrison, Rance and Gish, Robert K. 1995 (Jun). "Annual management report for the shellfish fisheries of the Eastern Aleutian Area," National Marine Fisheries Service.

North Pacific Fishery Management Council (NPFMC). 1994 (Sep 18). "Environmental Assessment/Regulatory Impact Review (EA/RIA) for license limitation alternatives for the groundfish and crab fisheries in the Gulf of Alaska and Bering Sea/Aleutian Islands."

Northern Economics and ResourcEcon. 1992 (Oct). "Margaret Bay Marine Terminal feasibility analysis."

NPFMC. 1995a (Sep). "Preliminary stock assessment and fishery evaluation report for the groundfish resources of the Bering Sea/Aleutian Islands regions as projected for 1996," Plan Team for the Groundfish Fisheries of the Bering Sea and Aleutian Islands.

NPFMC. 1995b (Sep). "Stock assessment and fishery evaluation report for the 1995 king and tanner crab fisheries of the Bering Sea and Aleutian Islands regions," Plan Team for the Groundfish Fisheries of the Bering Sea and Aleutian Islands.

ResourcEcon *et al.* 1991 (Nov). "Harbor facility demand study."

Smith, Terrence. 1992 (Jun). "Executive summary, Alaska seafood industry sector report," Institute of Social and Economic Research, University of Alaska.

Tracy, Donn A. 1995 (Jul). "Summary of the 1994 mandatory shellfish observer program database," Alaska Department of Fish and Game Region Information Report No. 4K95-32.

Tryck Nyman Hayes, Inc. *et al.* 1995 (Jun 30). "Northern Sea Route reconnaissance study - preliminary investigation, navigation improvement needs, Unalaska-Dutch Harbor, Alaska," Anchorage, AK.

Wespestad, Vidar G. 1995 (Sep). "Preliminary stock assessment and fishery evaluation report for the groundfish resources of the Bering Sea/Aleutian Island regions as projected for 1996 - Bering Sea/Aleutian Islands walleye pollock preliminary assessment for 1996 - summary," NPFMC.

Witherell, David. 1995. "Crab rebuilding committee report: minutes of the BSAI Groundfish and Crab Plan Team meeting, March 21-22, 1995," NPFMC.

APPENDIX C

GEOTECHNICAL REPORT

GEOTECHNICAL RECONNAISSANCE
for the
SMALL BOAT HARBOR IMPROVEMENT - SOUTH EXPANSION
SAND POINT, ALASKA

January 1998

1. SCOPE

The results of a reconnaissance visit, a test pit exploration, and a geophysical exploration for the south expansion to the existing small boat harbor in Sand Point are presented in this report.

The scope of the visit was to explore for bedrock along the eastward and southward boundaries of the south expansion area and to evaluate subsurface conditions with regard to dredging. In addition, a cursory evaluation of the existing dome quarry was performed with respect to rock quality and armor rock production potential.

2. PROJECT LOCATION AND DESCRIPTION

The community of Sand Point is located south of the Alaska Peninsula on Popof Island about 550 miles southwest of Anchorage. The existing harbor, heavily overcrowded, is located just south of the community in Humboldt Harbor. Several configuration and location alternatives for the harbor expansion have been considered. Of these, the designated alternative 1 was selected. This alternative entails dredging a new basin and constructing associated breakwaters just south of the existing boat harbor. The planned harbor basin and maneuvering area would encompass an area of approximately 8.6 acres, and the basin and entrance channel dredging limits are to extend to elevations –17 and –18 ft MLLW, respectively.

3. FIELD EXPLORATION AND PREVIOUS STUDIES

The current subsurface exploration for the project was conducted March 27, 1997. Five test pits were excavated to depths of about 2 to 14 feet with a John Deere 792 backhoe owned by Sand Point and operated by city personnel. The excavation of the test pits was supervised and logged by an engineer with the Corps of Engineers. The engineer measured the test pit locations with a cloth tape referencing existing topographical features, located on an aerial photograph and later surveyed. The locations of the test pits are shown on the Test Pit and Boring Location Map, and the test pit logs are enclosed.

Two previous investigations were conducted at this site. Peratrovich and Nottingham, Inc., performed a geophysical exploration in 1981, and Woodward-Clyde Consultants performed a geophysical and test boring exploration in 1985. The locations of the borings are shown on the Test Pit and Boring Location Map, and the test boring logs are enclosed. Unfortunately, the two geophysical explorations did not encompass the entire area within alternative 1. Therefore, an additional geophysical exploration was conducted in July 1997 by Golder Associates. The report of that exploration is attached.

4. SITE CONDITIONS

4.1 Surface

The proposed harbor area is bounded on the north by the south breakwater of the existing harbor and on the east by the shoreline. The shoreline within the proposed area, from north to south, is described as follows:

From the existing breakwater to a small point approximately 100 yards south, the shoreline is protected by constructed armor. The small point has been lowered by previous blasting and is reported to consist of competent rock. Its extent and configuration into the basis area is not presently known. A cove is encountered just beyond the small point which is bounded on the south by another point designated hereon as Intermediate Point. Another small cove is encountered just south of Intermediate Point and terminates at Black Point. Refer to the enclosed Test Pit Location Map for a visual understanding of the described shoreline.

The tidal fluctuation at Sand Point ranges approximately from elevation 11.5 to -3.5 ft MLLW, based on U.S. Coast and Geodetic Survey records. The areas to be dredged are located within this intertidal zone and also within the subtidal zone. The ground surface in the areas possibly to be dredged appears to range in elevation up to about +4 ft MLLW. The exposed beach at the points is covered with black gravel, cobbles, and boulders, and the exposed beach in the coves is covered with black gravel, cobbles, and boulders or tan sand.

4.2 Subsurface

The test pits were placed to search for bedrock along the southeastern boundary of the proposed basin. Test pits 1 and 2, (photos 1 through 4), located at the toe of the Intermediate Point, indicate the natural beach armor at those locations to be underlain by grey with black, sandy elastic silt and mottled orange with grey, sandy lean clay. Cobbles were encountered in the clay at a depth of 9 feet in test pit 1, and orange weathered bedrock was encountered at a depth of 3 feet in test pit 2. These materials were easily excavated to the depths shown with the 792 John Deere excavator.

Test pit 3 (photos 5 and 6) was excavated about 35 feet from the toe of the slope in the cove between Intermediate Point and the constructed armor shore. Test pit 4 (photos 7 and 8) was located about 55 feet seaward of test pit 3. The natural beach armor at those locations is underlain by tan silty sand with gravel, cobbles and boulders. Bedrock was encountered below the sand at a depth of 2 feet in test pit 3 and 4 feet in test pit 4. The bedrock was light tan with a granular texture and very hard. The 792 John Deere excavator was unable to excavate this material.

Test pit 5 (photos 9 and 10) was located at the toe of the constructed armor shore near its southward end. Brown and black, silty sand and tan and brown silty sand with gravel and cobbles were encountered to a depth of 3 feet at that location. The sands were underlain by tan weathered bedrock which transitions to orange with depth. The bedrock was easily excavated to a depth of about 12 feet, but excavation became difficult at that depth and refusal was encountered at a depth of 14 feet.

In general, the subsurface information available indicates an unconsolidated deposit, of varying thickness, composed of fine and coarse-grain soils containing cobbles and boulders overlying bedrock. The bedrock surface slopes toward the seaward direction. Refer to the test pit logs, the results of the geophysical exploration, and the test boring logs from the Woodward-Clyde exploration for subsurface conditions at specific locations.

5. DISCUSSION AND ANALYSIS

The three construction items of concern for the project are (1) foundation conditions for breakwaters, (2) the dredgability of the subsurface materials within the proposed basin area, and (3) the stability of excavated side slopes. These items are discussed below.

5.1 Foundation Conditions

The foundation materials above bedrock and beneath the breakwaters are composed primarily of coarse-grain soils and weathered or highly altered bedrock. These are suitable materials and should provide a stable foundation for the breakwaters. Foundation settlement should occur during construction and should be minimal.

5.2 Dredging Feasibility

The clay, sand, and gravel soils containing cobbles and boulders within the basin area should not present major problems provided dredging equipment is commensurate with these materials and conditions. However, there remains concern about dredging along the southeastern boundary of the planned basin. In this area, bedrock was encountered in the test pits, and the geophysical exploration indicates the bedrock surface to be higher than the design dredging limits. The concern is the competency of the bedrock and whether or not blasting will be required to remove it. Making this determination difficult is the presence of two bedrock types: an orange weathered bedrock and a tan granular bedrock. The upper surface of the orange weathered bedrock was excavatable to a depth of about 10 feet, while the tan granular bedrock was unexcavatable almost from the point it was encountered. With the available information, it is not possible to identify the boundaries between these bedrock types. Therefore, dredging requirements cannot be adequately determined, and the need or extent of blasting cannot be assessed.

5.3 Stability

Excavated slopes in the clay, sand, and gravel soils will be influenced by tidal fluctuation and wave erosion. Rather steep slopes may appear stable at the time of excavation, but will erode over time to a less steep slope. A maximum slope of about 3 horizontal : 1 vertical is estimated for these materials, based on experience and on observations of existing slopes at the site.

The dome quarry was visited and is still in operation. Some armor-size rock was stockpiled in the quarry (photos 11 and 12) at the time of the visit and was considered to be of high quality. With regard to production potential, the quarry has been in operation for periods over several years, and quite large amounts of rock have been removed. It is reported that the high-quality rock of the dome feature becomes smaller with depth, similar to an inverted cone. The remaining quantity of the high-quality rock is currently not known and therefore may or may not be sufficient for the current project.

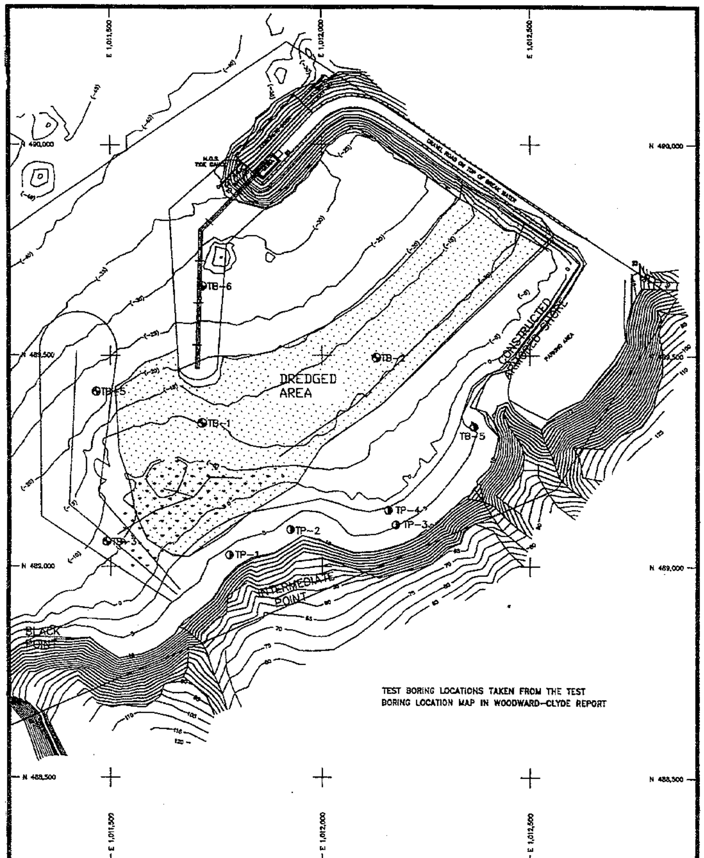
6. CONCLUSIONS

The expansion south of the existing small boat harbor can be accomplished as planned. However, more detailed subsurface information is needed along the southeastern boundary of the basin to assess the bedrock issue. It is recommended that a test boring exploration be conducted in this area of concern. The test borings could identify the bedrock types, determine their limits, and therefore establish blasting requirements. With this information, dredging quantities and costs could be properly evaluated.

FOLLOWING THE TEXT:

1. Test Pit and Boring Location Map
2. Test Pit Logs (TP-1 through TP-5)
3. Test Boring Logs (TB-1 through TB-6)
4. Photographs
5. Geophysical Survey Report by Golder Associates

CORPS OF ENGINEERS



ALASKA DISTRICT CORPS OF ENGINEERS GEOTECHNICAL BRANCH	TEST PIT AND BORING LOCATION MAP, ALTERNATIVE 1 SAND POINT SHB, ALASKA	SCALE: GRAPHIC DATE: JUL 1997 DWG/RVW: MDP/CRW \HARBORS\SPTTPIT1.DWG

ALASKA DISTRICT
CORPS OF ENGINEERS
GEOTECHNICAL BRANCH

Soils and Geology Section

EXPLORATION LOG

Project: Sand Point SBH Sand Point, Alaska			Page 1 of 1 Date: 27 MAR 97
Drilling Agency: [ ] Alaska District [XXX] Other City of Sand Point			Elevation Datum: [XXX] MSL [ ] other
Location: Northing: 489,028 Easting: 1,011,779			Top of Hole Elevation: 5.6 ft.
Hole Number: Field: TP-1 Permanent: TP-1	Driller: D. Stokes		Inspector: C. Wilson
Type of Hole: [ ] other [XXX] Test Pit [ ] Auger Hole [ ] Piezometer [ ] Monitoring Well	Depth to Groundwater:	Depth Drilled: ft.	Total Depth: 11 ft.
Hammer Weight: lbs.	Split Spoon I.D.: in.	Size and Type of Bit: in.	Type of Equipment: John Deere 792
Type of Samples: Grab			

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-818-2	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	%Gr	%Sa	%Fines	Max Size (in.)	PID (ppm)	% Water	Description and Remarks
0							Cobbles and Boulders							Black cobbles and boulders
1						MH	Elastic SILT							Gray with black, wet, plastic contains organics.
3						CL	Sandy Lean CLAY							Mottled with light gray, orange, wet, fine sand, plastic.
9						CL	Sandy Lean CLAY with Cobbles							Mottled with light gray, orange, wet, fine sand, plastic, contains cobbles.
11														Bottom of Hole 11.0 ft. Elevation -5.4 ft. Groundwater Not Encountered PID - Photo Ionization Detector

NPA Form 19-E
May 94 Prev. Ed. Obsolete

Project: Sand Point SBH

Hole Number: TP-1

ALASKA DISTRICT
CORPS OF ENGINEERS
GEOTECHNICAL BRANCH

Soils and Geology Section
EXPLORATION LOG

Project: Sand Point SBH, Sand Point, Alaska		Date: 27 MAR 97
Drilling Agency: [ ] Alaska District [XXX] Other City of Sand Point		Elevation Datum: [XXX] MSL [ ] oth.
Location: Northing: 489,087 Easting: 1,011,924		Top of Hole Elevation: 6.3 ft.
Hole Number: Field: TP-2 Permanent: TP-2	Driller: D. Stokes	Inspector: C. Wilson
Type of Hole: [XXX] Test Pit [ ] other [ ] Auger Hole [ ] Piezometer [ ] Monitoring Well	Depth to Groundwater:	Depth Drilled: ft. / Total Depth: 14 ft.
Hammer Weight: lbs. / Split Spoon I.D.: in. / Size and Type of Bit: in.	Type of Equipment: John Deere 792	Type of Samples: Grab

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-818-2	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size %Gr	%Sa	%Fines	Max Size (in.)	PID (ppm)	% Water	Description and Remarks
0							Cobbles and Boulders							Black cobbles and boulders
1						MH	Elastic SILT with sand							Gray with black, wet, fine sand, plastic, contains organics.
2						CL	Sandy Lean CLAY							Orange, wet, fine sand, plastic
3–14														Weathered orange rock, easily excavated.
14														Bottom of Hole 14.0 ft. Elevation -7.7 ft. Groundwater Not Encountered PID - Photo Ionization Detector

NPA Form 19-E
May 94 Prev. Ed. Obsolete

Project: Sand Point SBH

Hole Number: TP-2

ALASKA DISTRICT CORPS OF ENGINEERS GEOTECHNICAL BRANCH Soils and Geology Section EXPLORATION LOG	Project: Sand Point SBH Sand Point, Alaska	Page 1 of 1 Date: 27 MAR 97
	Drilling Agency: [ ] Alaska District [XXX] Other City of Sand Point	Elevation Datum: [XXX] MSL [ ] other
	Location: Northing: 469,099 Easting: 1,012,177	Top of Hole Elevation: 4.3 ft.

Hole Number: Field: TP-3 Permanent: TP-3	Driller: D. Stokes	Inspector: C. Wilson

Type of Hole: [XXX] Test Pit [ ] other [ ] Auger Hole [ ] Piezometer [ ] Monitoring Well	Depth to Groundwater:	Depth Drilled: ft.	Total Depth: 2.5 ft.

Hammer Weight: lbs.	Split Spoon I.D: in.	Size and Type of Bit: in.	Type of Equipment: John Deere 792	Type of Samples: Grab

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-818-2	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	%Gr	%Sa	%Fines	Max Size (in.)	PID (ppm)	% Water	Description and Remarks
														Black cobbles and boulders
1						SM	Silty SAND with gravel and cobbles							Tan,wet, angular gravel, fine to medium sand, contains cobbles
2							Bedrock							Light tan, granular texture, hard
3														Bottom of Hole 2.5 ft. Elevation 1.8 ft. Groundwater Not Encountered PID - Photo Ionization Detector
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														

NPA Form 19-E May 94 Prev. Ed. Obsolete	Project: Sand Point SBH	Hole Number: TP-3

ALASKA DISTRICT
CORPS OF ENGINEERS
GEOTECHNICAL BRANCH

Soils and Geology Section

EXPLORATION LOG

Project: Sand Point SBH Sand Point, Alaska		Page 1 of 1	Date: 27 MAR 97
Drilling Agency: [ ] Alaska District [XXX] Other City of Sand Point		Elevation Datum: [XXX] MSL [ ] other	
Location: Northing: 489,134 Easting: 1,012,156		Top of Hole Elevation: 1.6 ft.	
Hole Number: Field: TP-4 Permanent: TP-4	Driller: O. Stokes	Inspector: C. Wilson	
Type of Hole: [ ] other [XXX] Test Pit [ ] Auger Hole [ ] Piezometer [ ] Monitoring Well	Depth to Groundwater:	Depth Drilled: ft.	Total Depth: 4.5 ft.
Hammer Weight: lbs. Split Spoon I.D.: in.	Size and Type of Bit: in.	Type of Equipment: John Deere 792	Type of Samples: Grab

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-818-2	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size %Gr	%Sa	%Fines	Max Size (in.)	PID (ppm)	% Water	Description and Remarks
							Cobbles and Boulders							Black cobbles and boulders
1–3						SM	Silty SAND with gravel, Cobbles and Boulders							Tan, wet, angular gravel, fine to medium sand
4							Bedrock							Tan, granular texture, weathered and excavatable to 4.5 ft.
5–19														Bottom of Hole 4.5 ft. Elevation -2.9 ft. Groundwater Not Encountered PID - Photo Ionization Detector

NPA Form 19-E
May 94 Prev. Ed. Obsolete

Project: Sand Point SBH

Hole Number: TP-4

ALASKA DISTRICT
CORPS OF ENGINEERS
GEOTECHNICAL BRANCH

Soils and Geology Section

EXPLORATION LOG

Project: *Sand Point SBH*
Sand Point, Alaska

Page 1 of 1

Date: *27 MAR 97*

Drilling Agency: [ ] Alaska District [XXX] Other *City of Sand Point*

Elevation Datum: [XXX] MSL [ ] other

Location: Northing: *469,331* Easting: *1,012,367*

Top of Hole Elevation: *4.6 ft.*

Hole Number: Field: *TP-5* Permanent: *TP-5*

Driller: *D. Stokes*

Inspector: *C. Wilson*

Type of Hole: [ ] other [XXX] Test Pit [ ] Auger Hole [ ] Piezometer [ ] Monitoring Well

Depth to Groundwater:

Depth Drilled: ft.

Total Depth: *14 ft.*

Hammer Weight: lbs.

Split Spoon I.D.: in.

Size and Type of Bit: in.

Type of Equipment: *John Deere 792*

Type of Samples: *Grab*

Depth (ft.)	Lithology	Sample	Frozen ASTM D 4083	Frost Class. TM 5-818-2	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	%Gr	%Sa	%Fines	Max Size (in.)	PID (ppm)	% Water	Description and Remarks
0						SM	Silty SAND							Brown and black, wet, fine to medium sand, NP fines, contains some organics
1						SM	Silty SAND with gravel and cobbles							Tan and Brown, wet, angular gravel, fine to coarse sand, NP fines some cobbles
3														Weathered tan rock, easily excavated
8														Weathered orange and tan rock, easily excavated
13														Weathered orange rock, excavation becoming difficult
14														Bottom of Hole 14.0 ft. Elevation -9.4 ft. Groundwater Not Encountered PID - Photo Ionization Detector

NPA Form 19-E
May 94 Prev. Ed. Obsolete

Project: *Sand Point SBH*

Hole Number: *TP-5*

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: Sand Point Small Boat Harbor	SHEET 1 OF 3
	LOCATION (Coordinates or Station): N. E.	
	DRILLING AGENCY: ☐ CORPS OF ENGINEERS ☒ OTHER Woodward-Clyde Consultants	

Sh= 2.5 in. ID split spoon drive sample using 340 lb. hammer with 36 in. drop.

Field	Entry
HOLE NO. FIELD	SBH-1
HOLE NO. PERMANENT	
NAME OF DRILLER	Tim Tester
WEATHER	40°F wind N @ 5
TYPE OF HOLE	Rotary Wash (TEST PIT ☐ AUGER HOLE ☐ CHURN DRILL ☐)
DEPTH TO Mudline	-13 MLLW
DEPTH DRILLED INTO	
TOTAL DEPTH OF HOLE	31.5ft
SIZE AND TYPE OF BIT	4in. casing with 3 3/4in. tricone casing advancer
DATUM FOR ELEVATION SHOWN	☐ TBM. ☒ MLLW
TYPE OF EQUIPMENT	Failing 750
TOTAL NO. OF SAMPLES	9
TYPE OF SAMPLES	2.5in. ID Drive Samples
DEPTH TO GROUND-WATER	N/A
DATE HOLE STARTED	May 25 85
DATE HOLE COMPLETED	May 26 85
EL. TOP OF HOLE	-13 ftMLLW
Geologist	Victor Winters
Chief, Geology Section	
Chief, Foundations & Materials Branch	
Date	

Sample Type	DEPTH FEET	% WATER CONTENT	SAMPLE NO.	CLASSIFICATION	MAX SIZE PARTICLE	Blow Count	Recovery	DESCRIPTION & REMARKS
Sh	0–1		1 a	0-6ft dark grey-black SILTY SAND with ORGANICS (part as shells), GRAVEL & fractured rock to 2.5in. (SP)	3in.	11		
			b			7		
			c			7		
Sh	3		2 a			21		
			b			7		
	4		c			6		
Sh	5		3 a			3		torvane .3kg/cm^2 pocket penetrometer 1.5kg/cm^2
	6		b	6-31.5ft brown-grey SILTY CLAY with some SAND & GRAVEL to 1/2in. (probable highly altered/weathered bedrock)	1/2 in.	2		
			c			3		
Sh	8	25	4 a			2		
	9		b			3		torvane .56kg/cm^2 pocket penetrometer 1.75kg/cm^2
			c			5		
Sh	13	25	5 a			4		torvane .67kg/cm^2 pocket penetrometer 3.5kg/cm^2
			b			7		

NPA FORM 19 (REV) DEC. 1959

PROJECT Sand Point Small Boat Harbor PERMANENT HOLE NO. SBH#1

FIGURE 5

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT Sand Point Small Boat Harbor	SHEET 2 OF 3
	LOCATION (Coordinates or Station) N. E.	
	DRILLING AGENCY ☐ OTHER	☐ CORPS OF EN.
HOLE NO. FIELD SBH-1 PERMANENT	NAME OF DRILLER	WEATHER
TYPE OF HOLE: TEST PIT ☐ AUGER HOLE ☐ CHURN DRILL ☐	DEPTH TO / DEPTH DRILLED INTO	TOTAL DEPTH OF HOLE
SIZE AND TYPE OF BIT	DATUM FOR ELEVATION SHOWN ☐ TBM. ☐ MSL.	TYPE OF EQUIPMENT
TOTAL NO. OF SAMPLES / TYPE OF SAMPLES	DEPTH TO GROUND-WATER	DATE HOLE STARTED / COMPLETED
EL. TOP OF HOLE / Geologist	Chief, Geology Section	Chief, Foundations & Materials Branch / Date

Sample Type	DEPTH FEET	% WATER CONTENT	SAMPLE NO.	SOIL LEGEND	CLASSIFICATION	MAX SIZE PARTICLE	Blow Count	Recovery	DESCRIPTION & REMARKS
			5				7		
	15								
	16								
	17								
	18								
Sh		25	6 a				4		torvane greater than 1kg/cm^2
	19		b			$\frac{1}{2}$in.	5		pocket penetrometer 3.5kg/cm^2
			c				7		sample disturbed
	20								
	21								
	22								
	23								
Sh		25	7 a				5		torvane .8kg/cm^2
	24		b				7		pocket penetrometer 2.75kg/cm^2
			c				8		sample disturbed
	25								
	26								
	27								
Sh		25	8 a			2.5 in.	7		sample disturbe
			b				6		

NPA FORM 19 (REV) DEC. 1959

PROJECT Sand Point Small Boat Harbor PERMANENT HOLE NO. SBH-1

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT Sand Point Small Boat Harbor	SHEET 3 OF 3
HOLE NO. FIELD SBH-1 PERMANENT	LOCATION (Coordinates or Station) N. E.	
TYPE OF HOLE: TEST PIT ☐ AUGER HOLE ☐ CHURN DRILL ☐	DRILLING AGENCY ☒ OTHER Woodward-Clyde Consultants ☐ CORPS OF ENGINEERS	
SIZE AND TYPE OF BIT	NAME OF DRILLER	WEATHER
DATUM FOR ELEVATION SHOWN ☐ TBM. ☐ MSL.	DEPTH TO	DEPTH DRILLED INTO / TOTAL DEPTH OF HOLE
TOTAL NO. OF SAMPLES / TYPE OF SAMPLES	TYPE OF EQUIPMENT	
EL. TOP OF HOLE / Geologist / Chief, Geology Section	DEPTH TO GROUND-WATER / STARTED	DATE HOLE COMPLETED
	Chief, Foundations & Materials Branch	Date

Sample Type	DEPTH FEET	% WATER CONTENT	SAMPLE NO.	SOIL LEGEND	CLASSIFICATION	MAX SIZE PARTICLE	Blow Count	Recovery	DESCRIPTION & REMARKS
			8 c				8		
	29								
	30		9 a				6		
Sh	31	25	b				6		
			c				9		
					Bottom of hole 31.5ft				

NPA FORM 19 (REV) DEC. 1959

PROJECT Sand Point Small Boat Harbor PERMANENT HOLE NO. SBH-1

Sh= 2.5 in ID split spoon drive sample using 340 lb. hammer with 36 in. drop.

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA

EXPLORATION LOG

PROJECT: Sand Point Small Boat Harbor — SHEET 1 OF 3
LOCATION (Coordinates or Station): N. E.
DRILLING AGENCY: ☐ CORPS OF ENG ☒ OTHER Woodward-Clyde Consultants
HOLE NO.: FIELD SBH-2 PERMANENT
NAME OF DRILLER: Tim Tester
WEATHER: high overcast 45°F wind 10kts N
TYPE OF HOLE: Rotary Wash — TEST PIT ☐ AUGER HOLE ☐ CHURN DRILL ☐
DEPTH TO Mudline -20 ftMLLW
DEPTH DRILLED INTO
TOTAL DEPTH OF HOLE 31.5 ft.
SIZE AND TYPE OF BIT: 4 in. casing with 3 3/4 in. tricone casing advancer
DATUM FOR ELEVATION SHOWN: ☐ TBM. MLLW
TYPE OF EQUIPMENT: Failing 750
TOTAL NO. OF SAMPLES: 8
TYPE OF SAMPLES: 2.5 in. ID Drive Samples
DEPTH TO GROUND-WATER: N/A
DATE HOLE STARTED: May 24 85 COMPLETED: May 25 85
EL. TOP OF HOLE: -20ft MLLW
Geologist: V. Winters
Chief, Geology Section
Chief, Foundations & Materials Branch
Date

Sample Type	DEPTH FEET	% WATER CONTENT	SAMPLE NO.	SOIL LEGEND	CLASSIFICATION	MAX SIZE PARTICLE	Blow Count	Recovery	DESCRIPTION & REMARKS
Sh		SAT	1 a		0-15.25ft dark grey SILTY SAND with ORGANICS (as shells). (SP)	1/8 in.	4		
	1		b				4		
			c				5		
	2								
Sh	3		2 a			3/4 in.	9		
			b				8		
	4		c				8		
	5		3 a			1 1/4 in.	7		
Sh	6		b				6		
			c				6		
	7								
	8								
	9								
	10		4 a			1/8 in.	8		
Sh	11		b				7		
			c				7		
	12								
	13								

NPA FORM 19 (REV) DEC. 1959

PROJECT Sand Point Small Boat Harbor — PERMANENT HOLE NO. SBH-2

FIGURE 6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: Sand Point Small Boat Harbor	SHEET 2 OF 3
HOLE NO. FIELD: SBH-2 PERMANENT	LOCATION (Coordinates or Station) N. E.	
TYPE OF HOLE: TEST PIT ☐ AUGER HOLE ☐ CHURN DRILL ☐	DRILLING AGENCY ☐ CORPS OF ENGINEERS ☐ OTHER	
SIZE AND TYPE OF BIT	NAME OF DRILLER	WEATHER
DATUM FOR ELEVATION SHOWN ☐ TBM. ☐ MSL.	DEPTH TO / DEPTH DRILLED INTO / TOTAL DEPTH OF HOLE	
TOTAL NO. OF SAMPLES / TYPE OF SAMPLES	TYPE OF EQUIPMENT	
EL. TOP OF HOLE / Geologist / Chief, Geology Section	DEPTH TO GROUND-WATER / STARTED / DATE HOLE COMPLETED	Chief, Foundations & Materials Branch / Date

Sample Type	DEPTH FEET	% WATER CONTENT	SAMPLE NO.	SOIL LEGEND	CLASSIFICATION	MAX SIZE PARTICLE	Blow Count	Recovery	DESCRIPTION & REMARKS
Sh	15		5 a		15.25-18ft clean medium to coarse SAND. (SP)		11		
	16		b			1/4 in.	11		
			c				5		
	17								
	18				18-28.5ft grey SILTY SANDY CLAY with trace GRAVEL to 1/2 in. (probable highly altered/weathered bedrock)				
	19								
Sh	20		6 a				6		torvane .35kg/cm2
	21		b			1/4 in.	8		pocket penetrometer 1.25 kg/cm2
			c				8		
	22								
	23				23-23.5ft COBBLE				
	24								
Sh	25		7 a				5		torvane greater than 1kg/cm2
	26		b			1/2 in.	6		pocket penetrometer 2.25 kg/cm2
			c				11		
	27								

NPA FORM 19 (REV) DEC. 1959

PROJECT Sand Point Small Boat Harbor PERMANENT HOLE NO. SBH-2

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA
EXPLORATION LOG

PROJECT	Sand Point Small Boat Harbor
SHEET	3 OF 3
LOCATION (Coordinates or Station)	N. E.
DRILLING AGENCY	CORPS OF ENGINEERS / OTHER
HOLE NO. FIELD	SBH-2
HOLE NO. PERMANENT	
NAME OF DRILLER	
WEATHER	
TYPE OF HOLE	TEST PIT / AUGER HOLE / CHURN DRILL
DEPTH TO	
DEPTH DRILLED INTO	
TOTAL DEPTH OF HOLE	
SIZE AND TYPE OF BIT	
DATUM FOR ELEVATION SHOWN	TBM. / MSL.
TYPE OF EQUIPMENT	
TOTAL NO. OF SAMPLES	
TYPE OF SAMPLES	
DEPTH TO GROUND-WATER	
DATE HOLE STARTED	
DATE HOLE COMPLETED	
EL. TOP OF HOLE	
Geologist	
Chief, Geology Section	
Chief, Foundations & Materials Branch	
Date	

Sample Type	DEPTH FEET	% WATER CONTENT	SAMPLE NO.	SOIL LEGEND	CLASSIFICATION	MAX SIZE PARTICLE	Blow Count	Recovery	DESCRIPTION & REMARKS
	29				28.5-31.5ft highly altered and weathered volcanic BED-ROCK, resembles extremely dense silt with some sand.	1/8 in.			
	30								
Sh			8 a				18		
	31		b				31		torvane greater than 1kg/cm^2
			c				58		pocket penetrometer greater than 4.5kg/cm
	32				Bottom of hole 31.5 ft				

NPA FORM 19 (REV)
DEC. 1959

PROJECT Sand Point Small Boat Harbor PERMANENT HOLE NO. SBH-2

Sh= 2.5in. ID split spoon drive sample using 340 lb. hammer with 36 in. drop.

Cd= double tube core barrel 1.875 in. ID, Nx

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT Sand Point Small Boat Harbor	SHEET 1 OF 1
HOLE NO. FIELD SBH-3 PERMANENT	LOCATION (Coordinates or Station) N. E.	
	DRILLING AGENCY ☐ CORPS OF ENGINEERS ☒ OTHER Woodward-Clyde Consultants	
	NAME OF DRILLER Chuck Crowley	WEATHER partly cloudy 40°F wind N @ 5
TYPE OF HOLE Rotary TEST PIT ☐ AUGER HOLE ☐ CHURN DRILL ☐	DEPTH TO Mudline -7 -8ft MLLW; DEPTH DRILLED INTO	TOTAL DEPTH OF HOLE 10.5ft
SIZE AND TYPE OF BIT 4in. casing with 3 3/4 in. tricone casing advancer	DATUM FOR ELEVATION SHOWN ☐ TBM. ☒ MLLW	TYPE OF EQUIPMENT Failing 750
TOTAL NO. OF SAMPLES 5	TYPE OF SAMPLES 2.5in. drive samples and core barrel.; DEPTH TO GROUND-WATER	DATE HOLE STARTED 0900 25 May 85 COMPLETED 1200 25 May 85
EL. TOP OF HOLE -7ft MLLW	Geologist Robert Dugan; Chief, Geology Section	Chief, Foundations & Materials Branch; Date

Sample Type	DEPTH FEET	% WATER CONTENT	SAMPLE NO.	SOIL LEGEND	CLASSIFICATION	MAX SIZE PARTICLE	Blow count	recovery	DESCRIPTION & REMARKS
Sh	1	SAT	1 a b c		0-.5ft SAND with some ORGANICS. (SP) .5-10.5ft highly altered and weathered volcanic Bedrock closely spaced fractures. Most minerals degraded to clay. Friable multi-colored. Becomes harder at depth.	1/4 in.	4 4 5		Numerous cobbles and boulders to 3ft diameter observed on sea floor.
	2								
Sh	3 4		2 a b c				12 14 29		
Sh	5 6		3 a b c				25 74 62 REFUSAL		
Cd	7 8		4			2in.			RQD=0%
Cd	9 10		5			3in.			RQD=0%
	11 12 13				Bottom of Hole 10.5 ft				

NPA FORM 19 (REV) DEC. 1959

PROJECT Sand Point Small Boat Harbor PERMANENT HOLE NO. SBH-3

FIGURE 7

Sh= 2.5in. ID split spoon drive sample using 340 lb. hammer with 30 in. drop.

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA

EXPLORATION LOG

PROJECT	Sand Point Small Boat Harbor
SHEET	1 OF 5
LOCATION (Coordinates or Station)	N. E.
DRILLING AGENCY	☐ CORPS OF ENGINEERS ☒ OTHER Woodward-Clyde Consultants
HOLE NO. FIELD	SBH-4
HOLE NO. PERMANENT	
NAME OF DRILLER	Chuck Croley
WEATHER	Clear 45°F wind NW @ 10
TYPE OF HOLE	Rotary Wash ☐ TEST PIT ☐ AUGER HOLE ☐ CHURN DRILL
DEPTH TO	Mudline -30ft MLLW
DEPTH DRILLED INTO	
TOTAL DEPTH OF HOLE	58.5ft.
SIZE AND TYPE OF BIT	4 1/2 casing with 3 3/4 in. tricone casing advancer
DATUM FOR ELEVATION SHOWN	☐ TBM. ☒ MLLW
TYPE OF EQUIPMENT	Failing 750
TOTAL NO. OF SAMPLES	13
TYPE OF SAMPLES	2.5in. ID drive
DEPTH TO GROUND-WATER	N/A
DATE HOLE STARTED	1500 25 May 85
DATE HOLE COMPLETED	2345 25 May 85
EL. TOP OF HOLE	-30ft MLLW
Geologist	Robert Dugan
Chief, Geology Section	
Chief, Foundations & Materials Branch	
Date	

Sample Type	DEPTH FEET	% WATER CONTENT	SAMPLE NO.	SOIL LEGEND	CLASSIFICATION	MAX SIZE PARTICLE	Blow Count	recovery	DESCRIPTION & REMARKS
Sh	0–1	SAT	1 a		0-3ft black, medium SAND with some ORGANICS (shells, seaweed). (SP)	1/4 in.	4		
			b				5		
			c				6		
	2								
Sh	3		2 a		3-17.5ft gray SAND with trace CLAY and trace GRAVEL. (SW)		4		No recovery
			b				1		
	4		c				4		
Sh	5		3 a			1/4 in.	5		
	6		b				7		
			c				7		
	7								
	8								
	9								
Sh	10		4 a			1/4 in.	13		
	11	15	b				10		
			c				7		
	12								
	13								
	14								

NPA FORM 19 (REV)
DEC. 1959

PROJECT Sand Point Small Boat Harbor PERMANENT HOLE NO. SBH-4

· FIGURE

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT Sand Point Small Boat Harbor	SHEET 2 OF 5
HOLE NO. FIELD SBH-4 PERMANENT	LOCATION (Coordinates or Station) N. E.	
TYPE OF HOLE TEST PIT ☐ AUGER HOLE ☐ CHURN DRILL ☐	DRILLING AGENCY ☐ CORPS OF ENGINEERS ☐ OTHER	
SIZE AND TYPE OF BIT	NAME OF DRILLER	WEATHER
DATUM FOR ELEVATION SHOWN ☐ TBM. ☐ MSL.	DEPTH TO	DEPTH DRILLED INTO / TOTAL DEPTH OF HOLE
TOTAL NO. OF SAMPLES / TYPE OF SAMPLES	TYPE OF EQUIPMENT / DEPTH TO GROUND-WATER	DATE HOLE STARTED / COMPLETED
EL. TOP OF HOLE / Geologist B. Dugan/V. Winters	Chief, Geology Section	Chief, Foundations & Materials Branch / Date

Sample Type	DEPTH FEET	% WATER CONTENT	SAMPLE NO.	SOIL LEGEND	CLASSIFICATION	MAX SIZE PARTICLE	Blow count	recovery	DESCRIPTION & REMARKS
	14								
	15		5			1in.			
Sh		10	a				9		
			b				12		No Recovery
	16		c				11		
	17								
	18				17.5-58.5ft highly altered and highly to completely weathered volcanic Bedrock. Multi-colored. Exhibits character of soil, like sandy clay.				
	19								
	20		6			g.t. 2.5 in.			
Sh			a				27		
	21		b				27		
			c				30		
	22								
	23								
	24								
	25		7			1/8 in.			
Sh			a				22		
	26		b				29		torvane greater than 1kg/cm2 pocket penetrometer greater than 4.5kg/c
			c				49		
	27								
	28								

NPA FORM 19 (REV) DEC. 1959

PROJECT Sand Point Small Boat Harbor PERMANENT HOLE NO. SBH-4

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA

EXPLORATION LOG

- PROJECT: Sand Point Small Boat Harbor
- SHEET 3 OF 5
- LOCATION (Coordinates or Station): N. E.
- DRILLING AGENCY: ☐ CORPS OF ENGINEERS ☐ OTHER
- HOLE NO.: FIELD SBH-4 PERMANENT
- NAME OF DRILLER:
- WEATHER:
- TYPE OF HOLE: TEST PIT ☐ AUGER HOLE ☐ CHURN DRILL ☐
- DEPTH TO:
- DEPTH DRILLED INTO:
- TOTAL DEPTH OF HOLE:
- SIZE AND TYPE OF BIT:
- DATUM FOR ELEVATION SHOWN: ☐ TBM. ☐ MSL.
- TYPE OF EQUIPMENT:
- TOTAL NO. OF SAMPLES:
- TYPE OF SAMPLES:
- DEPTH TO GROUND-WATER:
- STARTED:
- DATE HOLE COMPLETED:
- EL. TOP OF HOLE:
- Geologist:
- Chief, Geology Section:
- Chief, Foundations & Materials Branch:
- Date:

Sample Type	DEPTH FEET	% WATER CONTENT	SAMPLE NO.	SOIL LEGEND	CLASSIFICATION	MAX SIZE PARTICLE	Blow count	recovery	DESCRIPTION & REMARKS
	29				highly weathered bedrock				
Sh	30		8			1/8 in.	14		torvane greater than 1kg/cm2
			a				23		pocket penetrometer
	31		b				26		greater than 4.5kg/c
			c						
	32								
	33								
	34								
Sh	35		9			g.t. 2.5 in.	14		
			a				28		
	36		b				54		
			c						
	37								
	38								
	39								
	40								
	41								

NPA FORM 19 (REV) DEC. 1959

PROJECT Sand Point Small Boat Harbor PERMANENT HOLE NO. SBH-4

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT Sand Point Small Boat Harbor	SHEET 4 OF 5
FIELD SBH-4 HOLE NO. PERMANENT	LOCATION (Coordinates or Station) N. E.	
TYPE OF HOLE: TEST PIT AUGER HOLE CHURN DRILL	DRILLING AGENCY: OTHER	CORPS OF ENGINEERS
SIZE AND TYPE OF BIT	NAME OF DRILLER	WEATHER
DATUM FOR ELEVATION SHOWN: TBM. MSL.	DEPTH TO	DEPTH DRILLED INTO / TOTAL DEPTH OF HOLE
TOTAL NO. OF SAMPLES	TYPE OF SAMPLES	TYPE OF EQUIPMENT
EL. TOP OF HOLE	Geologist	DEPTH TO GROUND-WATER / STARTED / DATE HOLE COMPLETED
	Chief, Geology Section	Chief, Foundations & Materials Branch / Date

Sample Type	DEPTH FEET	% WATER CONTENT	SAMPLE NO.	SOIL LEGEND	CLASSIFICATION	MAX SIZE PARTICLE	Blow count	recovery	DESCRIPTION & REMARKS
Sh			10 a		highly weathered bedrock	g.t. 2.5 in.	9		torvane greater than $1 kg/cm^2$
	43		b				21		pocket penetrometer greater than 4.5kg/c
			c				55		
	44								
	45								
	46								
	47								
Sh			11 a				12		
	48		b				20		
			c				25		
	49								
	50								
	51								
	52								
Sh			12 a				7		
	53		b				11		
			c				12		
	54								
	55								

NPA FORM 19 (REV) DEC. 1959

PROJECT Sand Point Small Boat Harbor PERMANENT HOLE NO. SBH-4

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA

EXPLORATION LOG

PROJECT Sand Point Small Boat Harbor — SHEET 5 OF 5

LOCATION (Coordinates or Station) N. E.

DRILLING AGENCY ☐ CORPS OF ENGINEERS ☐ OTHER

HOLE NO. FIELD SBH-4 PERMANENT

NAME OF DRILLER | WEATHER

TYPE OF HOLE: TEST PIT ☐ AUGER HOLE ☐ CHURN DRILL ☐

DEPTH TO | DEPTH DRILLED INTO | TOTAL DEPTH OF HOLE

SIZE AND TYPE OF BIT | DATUM FOR ELEVATION SHOWN ☐ TBM. ☐ MSL. | TYPE OF EQUIPMENT

TOTAL NO. OF SAMPLES | TYPE OF SAMPLES | DEPTH TO GROUND-WATER | DATE HOLE STARTED | COMPLETED

EL. TOP OF HOLE | Geologist | Chief, Geology Section | Chief, Foundations & Materials Branch | Date

Sample Type	DEPTH FEET	% WATER CONTENT	SAMPLE NO.	SOIL LEGEND	CLASSIFICATION	MAX SIZE PARTICLE	blow count	reco-very	DESCRIPTION & REMARKS
					highly weathered bedrock				
Sh	57		13 a				12	↓	
	58		b				19		
			c				24		
	59				Bottom of Hole 58.5ft.				
	60								

NPA FORM 19 (REV) DEC. 1959

PROJECT Sand Point Small Boat Harbor PERMANENT HOLE NO. SBH-4

Sh= 2.5in. 'D split poon drive sample using 340 lb. hammer with 36in. drop.

Cd= double tube core barrel 1.875in. ID Nx

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: Sand Point Small Boat Harbor — SHEET 1 OF 3 LOCATION (Coordinates or Station): N. E. DRILLING AGENCY: ☐ CORPS OF ENGINEERS ☒ OTHER Woodward-Clyde Consultants
FIELD — HOLE NO. SBH-5 PERMANENT	NAME OF DRILLER: Tim Tester/Chuck Croley — WEATHER: Clear 40°F wind N @ 10
TYPE OF HOLE: Rotary Wash — TEST PIT ☐ AUGER HOLE ☐ CHURN DRILL ☐	DEPTH TO Mudline −29ft.HT. — DEPTH DRILLED INTO — TOTAL DEPTH OF HOLE 36.5ft
SIZE AND TYPE OF BIT: 4in. casing with 3 3/4in. tricone casing advancer — DATUM FOR ELEVATION SHOWN: ☐ TBM ☒ MLLW	TYPE OF EQUIPMENT: Failing 750
TOTAL NO. OF SAMPLES: 10 — TYPE OF SAMPLES: 2.5in. ID drive samples and core barrel.	DEPTH TO GROUND-WATER: NA — DATE HOLE STARTED 1900hr 23 May 85 COMPLETED 0740hr 24 May 85
EL. TOP OF HOLE: −23ft MLLW — Geologist: V. Winters — Chief, Geology Section	Chief, Foundations & Materials Branch — Date

Sample Type	DEPTH FEET	% WATER CONTENT	SAMPLE NO.	SOIL LEGEND	CLASSIFICATION	MAX SIZE PARTICLE	Blow Count	Recovery	DESCRIPTION & REMARKS
Sh	0–1	SAT	1 a, b, c		0-4.5ft black SAND with ORGANICS and trace SILT, meduim grained, some shells. (SP)	1/8 in.	4, 4, 4		
	2								
Sh	3–4		2 a, b, c			1/4 in.	5, 8, 8		sample packed and disturbed.
Sh	5–6		3 a, b, c		4.5-7.5ft dark gray sandy GRAVEL with trace SILT and trace ORGANICS as shells. (GW)	1.5 in.	5, 10, 14		sample packed and disturbed.
	7–9				7.5-9.5ft SANDY GRAVEL with numerous COBBLES?				
Sh	10–11		4 a, b, c		9.5-12ft gray SILT with some SAND, stiff. (probable highly altered/ weathered bedrock)	1/4 in.	2, 2, 5		torvane .35kg/cm^2 pocket penetrometer .75kg/cm^2
	12–14				12-36.5ft highly to completely altered/ weathered andesitic bedrock, multi-colored in zones, porphyritic, close spaced joints.				

NPA FORM 19 (REV) DEC. 1959

PROJECT Sand Point Small Boat Harbor — PERMANENT HOLE NO. SBH-5

FIGURE 9

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA

EXPLORATION LOG

PROJECT: Sand Point Small Boat Harbor — SHEET 2 OF 3

LOCATION (Coordinates or Station): N. E.

DRILLING AGENCY: ☐ CORPS OF ENGR. ☐ OTHER

HOLE NO.: FIELD SBH-5 PERMANENT

NAME OF DRILLER | WEATHER

TYPE OF HOLE: TEST PIT ☐ AUGER HOLE ☐ CHURN DRILL ☐

DEPTH TO | DEPTH DRILLED INTO | TOTAL DEPTH OF HOLE

SIZE AND TYPE OF BIT | DATUM FOR ELEVATION SHOWN ☐ TBM. ☐ MSL. | TYPE OF EQUIPMENT

TOTAL NO. OF SAMPLES | TYPE OF SAMPLES | DEPTH TO GROUND-WATER | DATE HOLE STARTED | COMPLETED

EL. TOP OF HOLE | Geologist | Chief, Geology Section | Chief, Foundations & Materials Branch - Date

Sample Type	DEPTH FEET	% WATER CONTENT	SAMPLE NO.	SOIL LEGEND	CLASSIFICATION	MAX SIZE PARTICLE	Blow Count	Recovery	DESCRIPTION & REMARKS
	14								
	15								
Sh	16		5 a			1.5 in.	37		samples highly packed and disturbed.
			b				63		
	17		c				REFUSAL		
Sh	18		6 a			1.5 in.	44		sample packed and disturbed.
			b				70		
	19		c				REFUSAL		
	20								
	21								
	22								
	23								
Sh	24		7 a			1.5 in.	74		
			b				REFUSAL		
	25		c						
	26								
Sh			8 a			1.5 in.	80		
	27		b				REFUSAL		
	28		c						

NPA FORM 19 (REV) DEC. 1959

PROJECT Sand Point Small Boat Harbor PERMANENT HOLE NO. SBH

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT Sand Point Small Boat Harbor	SHEET 3 OF 3
	LOCATION (Coordinates or Station) N. E.	
	DRILLING AGENCY	CORPS OF ENGINEERS / OTHER
HOLE NO. FIELD SBH-5 PERMANENT	NAME OF DRILLER	WEATHER
TYPE OF HOLE: TEST PIT / AUGER HOLE / CHURN DRILL	DEPTH TO / DEPTH DRILLED INTO	TOTAL DEPTH OF HOLE
SIZE AND TYPE OF BIT / DATUM FOR ELEVATION SHOWN: TBM. MSL.	TYPE OF EQUIPMENT	
TOTAL NO. OF SAMPLES / TYPE OF SAMPLES	DEPTH TO GROUND-WATER / STARTED	DATE HOLE COMPLETED
EL. TOP OF HOLE / Geologist	Chief, Geology Section	Chief, Foundations & Materials Branch / Date

Sample Type	DEPTH FEET	% WATER CONTENT	SAMPLE NO.	SOIL LEGEND	CLASSIFICATION	MAX SIZE PARTICLE	Blow count	Recovery	DESCRIPTION & REMARKS
	30								
	31								
Sh	32		9 a, b, c			1/4 in.	96 REFUSAL	Y	
	33								
	34								
Cd	35		10						RQD=0 %
	36								
	37				Bottom of Hole 36.5ft.				
	38								
	39								
	40								
	41								
	42								

NPA FORM 19 (REV)
DEC. 1959

PROJECT Sand Point Small Boat Harbor PERMANENT HOLE NO. SBH-5

Sh= 2.5 in. ID split spoon drive sample using 340 lb. hammer with 36in. drop.

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: Sand Point Small Boat Harbor — SHEET 1 OF 4 LOCATION (Coordinates or Station) N. E. DRILLING AGENCY: ☐ CORPS OF ENGINEERS ☒ OTHER Woodward-Clyde Consultants
HOLE NO. FIELD SBH-6 PERMANENT SBH-6	NAME OF DRILLER: Chuck Croley — WEATHER: Cloudy 35° F wind E @ 10
TYPE OF HOLE: Rotary Wash — TEST PIT ☐ AUGER HOLE ☐ CHURN DRILL ☐	DEPTH TO Mudline — 26.5 ft — DEPTH DRILLED INTO — TOTAL DEPTH OF HOLE 53ft
SIZE AND TYPE OF BIT: 4 in. casing with 3 3/4 in. tricone casing advancer — DATUM FOR ELEVATION SHOWN: ☐ TBM. ☒ MLLW	TYPE OF EQUIPMENT: Failing 750
TOTAL NO. OF SAMPLES: 12 — TYPE OF SAMPLES: 2.5 in. ID Drive Samples	DEPTH TO GROUND-WATER: N/A — DATE HOLE STARTED 09:00 May 24 85 — COMPLETED 20:00 May 24 85
EL. TOP OF HOLE: -26.5ftMLLW — Geologist: Robert Dugan — Chief, Geology Section	Chief, Foundations & Materials Branch — Date

Sample Type	DEPTH FEET	% WATER CONTENT	SAMPLE NO.	SOIL LEGEND	CLASSIFICATION	MAX SIZE PARTICLE	Blow Count	Recovery	DESCRIPTION & REMARKS
Sh	0–2	SAT	1 a, b, c		0-2ft black to dark grey, medium to fine SAND with trace ORGANICS, shells and trace SILT. (SW)	1/8 in.	3, 3, 12		
Sh	2–4.5	SAT	2 a, b, c		2-4.5ft blue-grey medium to fine SAND with trace SILT, trace GRAVEL and trace ORGANICS, some shells. (SW)	1/2 in.	8, 11, 12		packed and disturbed sample
Sh	4.5–8.5	SAT	3 a, b, c		4.5-8.5ft gray-brown coarse SAND with some GRAVEL, angular, and trace SILT, dense. (SP)	1in.	10, 15, 19		
	8.5–11				8.5-11ft SANDY GRAVEL with COBBLES?				
Sh	11–14	20	4 a, b, c		11.0-15ft brown SANDY SILT, trace GRAVEL. (ML)	1in	4, 7, 10		torvane .34kg/cm² pocket penetrometer 3kg/cm²

NPA FORM 19 (REV) DEC. 1959

PROJECT Sand Point Small Boat Harbor PERMANENT HOLE NO. SBH-6

FIGURE 1C

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA

EXPLORATION LOG

PROJECT Sand Point Small Boat Harbor			SHEET 2 OF 4	
LOCATION (Coordinates or Station) N. E.				
DRILLING AGENCY ☐ CORPS OF ENGINEERS ☐ OTHER				
HOLE NO. FIELD SBH-6 PERMANENT	NAME OF DRILLER		WEATHER	
TYPE OF HOLE: TEST PIT ☐ AUGER HOLE ☐ CHURN DRILL ☐	DEPTH TO	DEPTH DRILLED INTO	TOTAL DEPTH OF HOLE	
SIZE AND TYPE OF BIT	DATUM FOR ELEVATION SHOWN ☐ TBM. ☐ MSL.	TYPE OF EQUIPMENT		
TOTAL NO. OF SAMPLES	TYPE OF SAMPLES	DEPTH TO GROUND-WATER	DATE HOLE STARTED	COMPLETED
EL. TOP OF HOLE	Geologist	Chief, Geology Section	Chief, Foundations & Materials Branch	Date

Sample Type	DEPTH FEET	% WATER CONTENT	SAMPLE NO	SOIL LEGEND	CLASSIFICATION	MAX SIZE PARTICLE	Blow count	Recovery	DESCRIPTION & REMARKS
	14								
	15				15-38ft gray SILTY CLAY with some SAND and trace GRAVEL. (probable highly altered/weathered bedrock)				
	16								
Sh	17	20	5 a			1in.	4		torvane .9kg/cm^2 pocket penetrometer 3kg/cm^2
	18		b				5		
			c				8		
	19								
	20								
	21								
	22								
Sh	23	20	6 a				4		
	24		b			1/2 in.	6		
			c				8		
	25								
	26								
Sh	27		a				4		torvane .9kg/cm^2 pocket penetrometer 3.25kg/cm^2
			b				15		
	28		c				15		

NPA FORM 19 (REV) DEC. 1959

PROJECT Sand Point Small Boat Harbor PERMANENT HOLE NO. SBH-6

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA

EXPLORATION LOG

PROJECT: Sand Point Small Boat Harbor | SHEET 3 OF 4
LOCATION (Coordinates or Station): N. E.
DRILLING AGENCY: ☐ CORPS OF ENGINEERS ☐ OTHER
HOLE NO. FIELD: SBH-6 PERMANENT
NAME OF DRILLER | WEATHER
TYPE OF HOLE: TEST PIT ☐ AUGER HOLE ☐ CHURN DRILL ☐
DEPTH TO | DEPTH DRILLED INTO | TOTAL DEPTH OF HOLE
SIZE AND TYPE OF BIT | DATUM FOR ELEVATION SHOWN ☐ TBM. ☐ MSL. | TYPE OF EQUIPMENT
TOTAL NO. OF SAMPLES | TYPE OF SAMPLES | DEPTH TO GROUND-WATER | STARTED | DATE HOLE COMPLETED
EL. TOP OF HOLE | Geologist | Chief, Geology Section | Chief, Foundations & Materials Branch | Date

Sample Type	DEPTH FEET	% WATER CONTENT	SAMPLE NO.	SOIL LEGEND	CLASSIFICATION	MAX SIZE PARTICLE	Blow Count	Recovery	DESCRIPTION & REMARKS
	28								
	29								
	30								
	31		8						
Sh	32	20	a			1 in	7		torvane .95kg/cm^2 pocket penetrometer 3kg/cm^2
			b				9		
	33		c				13		
	34								
	35								
	36		9						
	37	20	a				3		torvane in clay .52kg/cm^2 pocket penetrometer 3.2kg/cm^2
Sh			b				9		
	38		c		38-53ft gray volcanic BEDROCK (andesite?), highly altered and weathered. Resembles extremely dense silt with some clay.		18		
	39								
	40								
	41		10						
Sh	42		a				11		

NPA FORM 19 (REV) DEC. 1955

PROJECT Sand Point Small Boat Harbor PERMANENT HOLE NO. SBH-6

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA

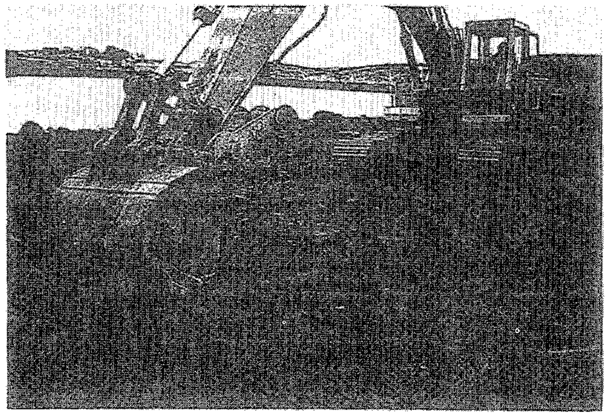
EXPLORATION LOG

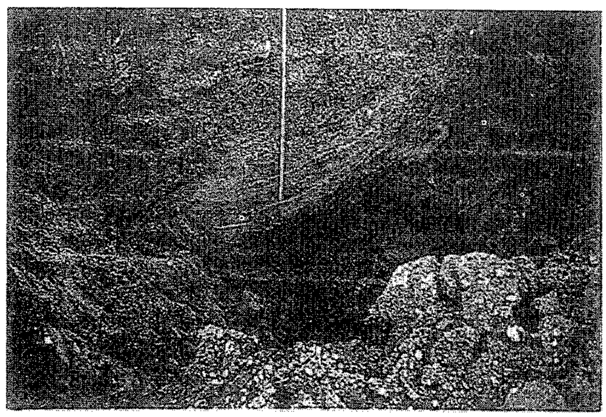
PROJECT: Sand Point Small Boat Harbor | SHEET 4 OF 4
LOCATION (Coordinates or Station): N. E.
DRILLING AGENCY: OTHER / CORPS OF ENGINEERS
HOLE NO. FIELD: SBH-6 PERMANENT:
NAME OF DRILLER: | WEATHER:
TYPE OF HOLE: TEST PIT / AUGER HOLE / CHURN DRILL
DEPTH TO: | DEPTH DRILLED INTO: | TOTAL DEPTH OF HOLE:
SIZE AND TYPE OF BIT: | DATUM FOR ELEVATION SHOWN: TBM. / MSL. | TYPE OF EQUIPMENT:
TOTAL NO. OF SAMPLES: | TYPE OF SAMPLES: | DEPTH TO GROUND-WATER: | DATE HOLE STARTED: | COMPLETED:
EL. TOP OF HOLE: | Geologist: | Chief, Geology Section: | Chief, Foundations & Materials Branch: | Date:

Sample Type	DEPTH FEET	% WATER CONTENT	SAMPLE NO.	SOIL LEGEND	CLASSIFICATION	MAX SIZE PARTICLE	Blow Count	Recovery	DESCRIPTION & REMARKS
Sh	42	5	10 a				16		torvane .54kg/cm^2
	43		b				21		pocket penetrometer greater than 4.5kg/cm
	44								
	45								
	46								
Sh	47	5	11 a				6		torvane greater than 1kg/cm^2
			b				16		pocket penetrometer greater than 4.5kg/cm^2
	48		c				22		
	49								
	50								
	51								
Sh	52		12 a				12		
			b				18		
	53		c		Bottom of hole 53ft		23		

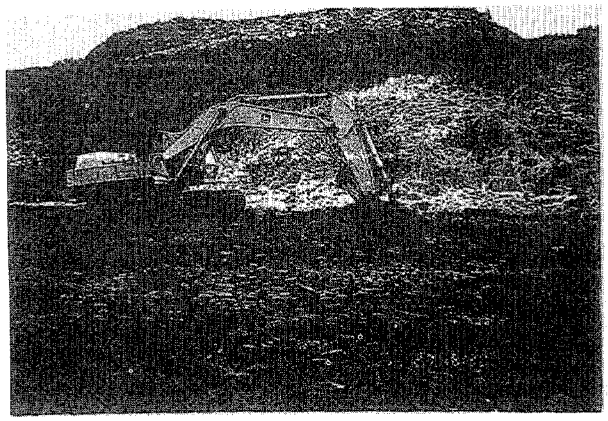
NPA FORM 19 (REV) DEC. 1959

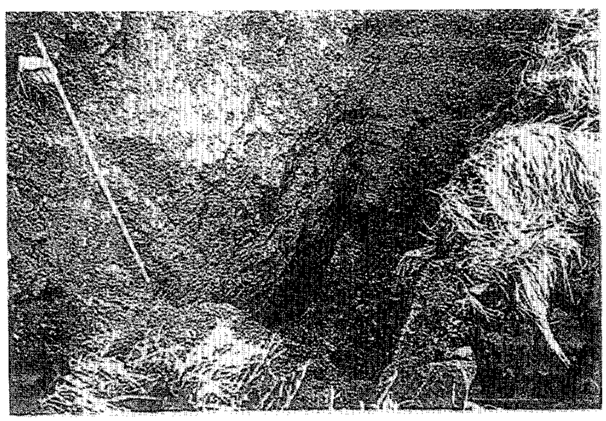
PROJECT Sand Point Small Boat Harbor PERMANENT HOLE NO. SBH -6



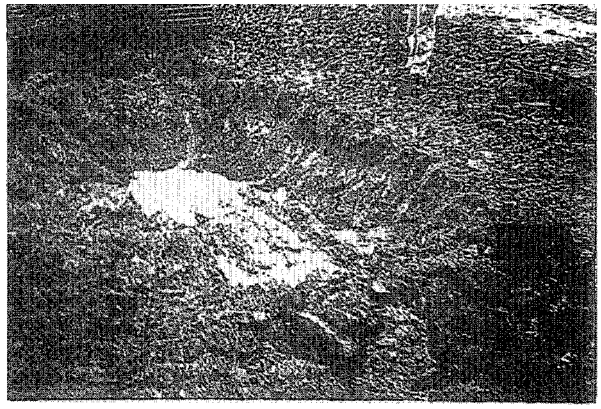


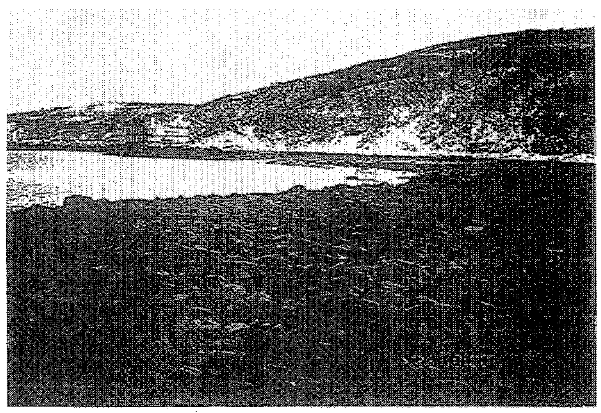
Photos 1 and 2: Test Pit 1



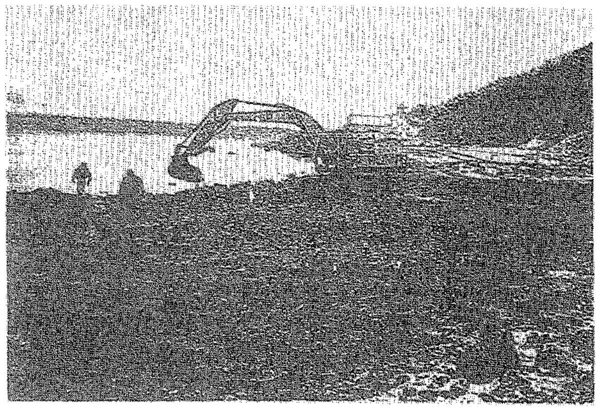


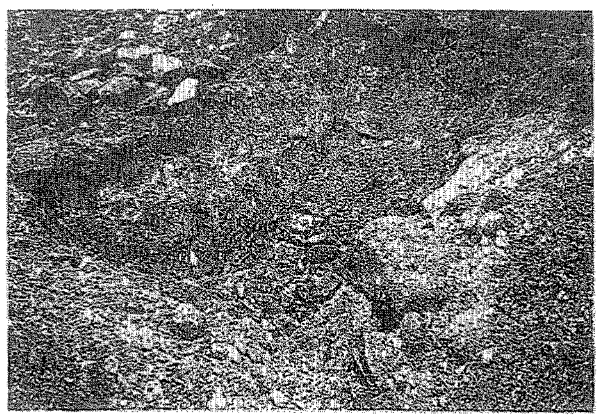
Photos 3 and 4: Test Pit 2





Photos 5 and 6: Test Pit 3 and the Location of Test Pit 3 in Cove between Intermediate Point and The Constructed Armored Shore





Photos 7 and 8: Test Pit 4

Photos 9 and 10: Test Pit 5

Photos 11 and 12: Dome Quarry

October 30, 1997

973-5287x005

Department of the Army
U.S. Army Engineer District, Alaska
P.O. Box 898
Anchorage, AK 99506-0898

Attention: Mr. Jerry Raychel, P.E.

RE: REPORT FOR GEOPHYSICAL SURVEY, HUMBOLDT HARBOR SAND POINT, ALASKA

Dear Mr. Raychel:

Golder Associates Inc. (GAI) is pleased to present the following report summarizing the results of the marine geophysical survey conducted for the proposed expansion of Humboldt Harbor at Sand Point, Alaska. This project was conducted under Contract No. DACA85-96-D-0002, Delivery Order No. 005.

If you have any questions regarding the results or interpretation presented in this report please contact us at (907) 344-6001.

Sincerely,

GOLDER ASSOCIATES INC.

Rory Retzlaff/MRM

Rory Retzlaff
Project Geophysicist

Robert G. Dugan, C.P.G.
Associate and Senior Engineering Geologist

Golder Associates

Report To

The Department of the Army
U.S. Army Engineer District, Alaska

For

GEOPHYSICAL SURVEY AT HUMBOLDT HARBOR
SAND POINT, ALASKA

October 1997

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

List of Figures

List of Maps

List of Appendices

1. INTRODUCTION

The following report summarizes the results of the marine geophysical survey conducted by Golder Associates for the proposed expansion of Humboldt Harbor at Sand Point, Alaska. This project was conducted for the Alaska District Corps of Engineers under Contract No. DACA85-96-D-0002, Delivery Order No. 005. Navigation was provided by Terra Surveys of Palmer, Alaska. Field work began on July 29, 1997 and was completed on July 30, 1997. Bathymetric data were previously collected by Dowl Engineers in May, 1997 and provided to Golder Associates as 1 ft contours on an AutoCAD base map (Sheet 1).

2. SURVEY OBJECTIVES

The Alaska District Corps of Engineers is conducting a study to determine the feasibility of expanding Humboldt Harbor southwest of the existing breakwater housing the city dock. The study area is shown in Figure 1. The final scope of the expansion project is yet to be determined and a preliminary investigation using offshore marine geophysical techniques was requested to assist in evaluating site conditions.

Previous investigations included five test pits drilled in the intertidal zone by the Alaska District Corps of Engineers in March, 1997 and six offshore boreholes drilled by Woodward Clyde Consultants in May, 1985 (Sheets 1 through 4). Logs for these test pits and boreholes are provided in Appendices A and B, respectfully. Data from these earlier investigations indicate that portions of the site are underlain by exposed or shallow bedrock. The competency of the bedrock material encountered in the test pits and boreholes was highly variable, ranging from hard to completely altered or weathered. This variability in the competency of the bedrock is also observed in the road cuts and outcrops located on shore. The objectives of this geophysical survey were to;

- Perform a subbottom geophysical survey to map the top of bedrock beneath the overlying unconsolidated sediments,
- Perform a seismic refraction survey to assist in defining changes in the excavatability of the bedrock across the site based on the seismic velocity of the bedrock,

- Develop an isopach map of the sediments overlying bedrock, and
- Provide geologic interpretations of materials to be expected during development of the site.

3. GEOLOGIC SETTING

3.1 Regional Geology

Sand Point is located on Popof Island, a member of the Shumagin Island group, near the southern tip of the Alaska Peninsula at 55°20′ north latitude and 160°30′ west longitude. The island has an approximate diameter of 9 miles with a maximum elevation of 1,520 ft above sea level.

The Shumagin Island group is bounded to the north by the Alaska Peninsula and to the south by the Aleutian Trench. Subduction of the Aleutian Trench is the major tectonic force affecting the geology of the region. The area is one of the most seismically active in the world.

Active volcanoes occupy the Alaska Peninsula and are aligned parallel to the Aleutian Trench. Some of the volcanoes are visible from Popof Island. Older Intrusives, the nearest being the Shumagin batholith (Tertiary), form a belt of plutonism midway between the trench and the peninsula (Burk, 1965). The region was glaciated during the Pleistocene Epoch which modified the uplifted land mass to its present configuration.

Popof Island has varied terrain, with rugged mountains to the east and broad lowlands to the west. Most lowland slopes are covered with unconsolidated sediments, brush, and tundra; however, bedrock is generally well exposed at higher elevations and along the sea cliffs which bound much of the island.

Although Tertiary sedimentary rocks of the Stepovak formation crop out on the northwest portion of Popof Island, the island is composed primarily of Tertiary volcanic rocks. The majority of the volcanic rock units are intermediate-to-mafic andesite flows and flow breccias which dip southwesterly and overlie a sequence of welded tuff-breccias. Some volcanic rock units are significantly altered. Occasional small domes and other intrusive structures composed of andesite, basalt, or dacite have intruded the slightly-older volcanic rock units.

3.2 Site Geology

The harbor expansion area is situated at the base of a moderately steep slope with outcrops of volcanic bedrock. Dome Quarry, an intrusive basalt structure which formed a prominent knob prior to its excavation for armor stone, is situated about 400 ft upslope of the survey area. The basalt produced at Dome Quarry consisted of fresh, black, competent rock which was bounded by less competent, highly-altered, andesitic bedrock. A basaltic dike appears to radiate from the quarry, intersecting the coast at Black Point. The altered andesitic bedrock underlying most of the area varies widely in strength, ranging from medium strong to extremely weak. Conchiodal weathering is evident in road cuts.

Based on boreholes drilled by Woodward Clyde (1985) and test pits excavated by the Corps, the harbor expansion area is underlain by mostly sandy-gravelly unconsolidated materials which overly weathered/altered volcanic bedrock. The minerals have weathered to clay in some of the bedrock, giving it the consistency of soil.

4. GEOPHYSICAL INSTRUMENTATION AND FIELD PROCEDURES

The geophysical instruments, seismic reflection system, and navigation system were installed on the survey vessel in Sand Point. In general, sea conditions were good during the survey and no time was lost due to bad weather. It was necessary, however, to conduct the survey during high tide due to the shallow water conditions.

4.1 Horizontal Positioning and Survey Coverage

Navigation and positioning of the survey vessel, was conducted with a differential global positioning system (DGPS) using the coast guard beacon at Cold Bay, Alaska. Initial adjustments to the differential corrections and calibration checks were performed using on-shore monuments as shown on the site base map (Sheet 1). Horizontal control and vessel tracking used a Trimble Model 4000SSE DGPS system that was interfaced with the data acquisition system. The data acquisition system (Coastal Oceanographic Hypack software) acquired position fixes at a rate of 1 second and provided fiducial or fix marks to the geophysical graphic recorders at a 20 second interval.

A total of 26 tracklines were run for the continuous seismic reflection profiling and shot point locations were recorded along the seismic refraction line (Sheet 2). The primary tracklines were run subparallel to the shoreline (southwest-northeast) and spaced at a 50 ft. interval. In addition, nine crosslines were run perpendicular to shoreline (northwest-southeast) to assist in interpreting the seismic reflection data. The refraction survey was performed along a line parallel to the shoreline and in shallow water (Sheet 2). Seismic refraction shots were fired at 105 ft. intervals along line. Shots were fired in both forward and reverse directions (i.e. full line coverage with the boat traveling in opposite directions). The location of each shot point was recorded by manually triggering the navigation system to record an event at the time of the shot.

4.2 Bathymetry

Bathymetry data were previously collected by Dowl Engineers in May, 1997. These data were provided to Golder Associates, prior to the geophysical survey, as 1-ft. contours on an AutoCAD base map (Sheet 1).

4.3 Seismic Reflection Systems

Two seismic reflection systems were made available on board the vessel.

- An EGG Model 234 Uniboom System (with a fundamental frequency range of 800-2000 Hz), and
- A Data Sonics Model 1200 Bubble Pulser System (with a fundamental frequency range of 300-800 Hz.

The higher frequency Uniboom system provides better resolution but lesser depth penetration compared to lower frequency Bubble Pulser system. Consequently, both systems were mobilized to Sand Point due to the uncertainty in the depth to oedrock across the survey area. A test of both systems was performed at the start of the survey. This test determined that the Uniboom system provided adequate depth penetration while providing superior resolution in areas with shallow bedrock. Therefore, the entire survey was performed with the Uniboom system.

The acoustic energy source was towed midship on the port side of the vessel and the hydrophone off the starboard side of the bow, approximately 5 ft. forward of the navigation antenna.

4.4 Seismic Refraction System

The seismic refraction system consisted of a 12-channel hydrophone streamer connected to a 24-channel Geometrics Strataview seismograph. The steamer had a hydrophone spacing of 15 ft. providing a total spread length of 165 ft. The acoustic source for the refraction work was a shotgun (a.k.a. buffalo gun) which fires blank, 12-gauge, shotgun shells. The shotgun source was mounted inside a PVC tube secured to the port side rail of the vessel. A standard timing trigger (i.e. hammer switch) was mounted on the shotgun source to trigger the seismograph. The distance between the source and the hydrophone nearest the boat was fixed at 85 ft.

5. GEOPHYSICAL SURVEY RESULTS

5.1 Bathymetric Data

In general, the seafloor is relatively shallow in the survey area. Water depths were typically less than 35 ft. and the seafloor maintains a relatively constant slope over much of the site (Sheet 1). Several deviations from this overall trend were observed:

- An area of shallow water, approximately 500 feet wide, projects off shore from the location of Test Pit TP-1 extending to Borehole SBH-5. This area has heavy kelp growth and boulder sized seafloor sediments.
- The seafloor dips steeply immediately off shore of Black Point, located at the southwest end of the site, before transitioning to the predominant slope of the seafloor further off shore.
- An anomalous mound on the seafloor is evident in the bathymetric data approximately 100 ft. northeast of Borehole SBH-6. This mound was also observed on seismic reflection records. The edge of this feature is visible as a rise in the seafloor on Figure 3 at event number 94. The origin and make-up of this mound is unknown, however, the seismic reflection data show bedrock at a depth of approximately 30 ft. below the seafloor at this location suggesting that this feature is surficial and not a bedrock knob.

5.2 Seismic Reflection Data

The seismic reflection system was able to achieve subsurface penetration of 60 ft. The general quality of the reflection data is considered good, and the interpreted bedrock reflector is laterally continuous over much of the site. Internal layering and crossbedding features within the sediments overlying the bedrock were also resolved by the seismic reflection data. The top of bedrock was interpreted to be the deepest reflector that could be interpreted on the data. In the deep-water areas, and in areas where bedrock is covered by more than 6 ft. of sediment, this contact was quite distinct. In shallow water areas, and in areas where the bedrock was covered with less than 6 ft. of sediment, or where thick kelp growth was present, it was often difficult to clearly identify the contact. In particular, the presence of large boulders and kelp in the shallow water area between Test Pit TP-1 and

Borehole SBH-5 (Sheet 1) made it difficult to identify the bedrock reflector in this area. For these reasons the sediment thickness, and associated elevation of the bedrock surface, can only be considered approximate in these areas.

Annotated examples of six continuous seismic reflection records are shown on Figures 2 through 7. Figures 2, 3, and 4 show records for lines 3, 6, and 15 oriented subparallel to the shoreline (Sheet 2). Figures 5, 6, and 7 show records for lines 30, 27, and 24 oriented perpendicular to the shoreline (Sheet 2). The seafloor reflector, the interpreted top of bedrock reflector, and the overlying sediments are annotated on all six example records. Water-bottom multiples, which are artifacts created by the seismic signal reverberating in the water column, were observed on most of the reflection records throughout the site and are annotated on the example records shown on the figures. At several locations in the southwest portion of the site, bedrock features that resemble possible dike-like structures were observed on lines oriented subparallel to shoreline. Examples of these dike-like structures can be seen on the example records for lines 3 and 6 (Figures 2 and 3). These structures are characterized by a rise in the top of bedrock, presumably the result of bedrock that is more resistive to weathering and, in some locations, upturned sediments at the edges of the structures, presumed to be sediments draped over the resistant bedrock.

The interpreted sediment thickness overlying bedrock was scaled from the reflection data at each event location, approximately every 90 ft, and subtracted from the seafloor elevation at that location to obtain the elevation of the top of bedrock. The seafloor elevation values were taken from the bathymetric maps provided by Dowl Engineers and the vertical scale for the reflection data was calculated assuming a seismic velocity of 5,500 ft./second for the saturated sediments. These bedrock elevation data were contoured at a 2-ft. interval to produce the top-of-bedrock contour map presented on Sheet 3. The sediment thickness values were also contoured at a 2-ft. interval to produce sediment isopach map presented on Sheet 4. In addition, the outer edges of the interpreted dike-like structures were correlated between adjacent tracklines and are presented in plan view on the top-of-bedrock contour map (Sheet 3).

5.3 Seismic Refraction Data

The arrival time of the initial onset of seismic energy, referred to as the "first arrivals", were picked at each hydrophone for all shot points. Except in the area of deep water southwest of Black Point, all first arrivals were interpreted to originate from the bedrock interface. The differences in the arrival time of refracted energy from the bedrock, calculated by subtracting first arrivals from forward and reverse shots, were plotted against distance along line to produce the difference-in-arrival-time plot presented on Figure 8. The slope of the line created by the data points on Figure 8 is equal to 2 divided by the velocity of the bedrock. Changes in the slope of the line indicate lateral changes in the velocity of the bedrock.

A lateral change in the bedrock velocity is interpreted at four locations along line and correlate to observed changes in the slope of the line formed by the data on Figure 8. The location of the seismic refraction line and the interpreted changes in bedrock velocity were plotted on the top-of-bedrock contour map for comparison to the borehole and test pit data and the interpreted dike-like structures.

An integrated interpretation and comparison with the borehole and test pit data is discussed in the following section.

5.4 Integrated Interpretation and Comparison to the Borehole and Test Pit Data

A good correlation is observed between bedrock contact interpreted from the reflection data and the "probable highly altered bedrock" material indicated on the logs for Boreholes SBH-1 through SBH-6 (Appendix B and Sheet 4). Simplified logs for the boreholes located near the example profiles presented in Figures 3, 4, and 6 are presented as stick diagrams and plotted on the seismic data shown on the figures. Mis-ties to the borehole data are less than 5 feet at all locations. The largest mis-tie is at Borehole SBH-1 where the bedrock is less than 1 ft deep on the borehole log, but just under 6 ft of sediment was interpreted from the seismic data. As mentioned earlier, it is difficult to resolve the bedrock contact with these seismic data in areas where it is less than 6 ft deep and the interpreted depths in these shallow bedrock areas can only be considered approximate. It should also be noted that coordinates for the boreholes were not available and their position was manually scaled off another base map with much less detail than the ones presented here. Therefore, the accuracy of borehole locations is uncertain, although thought to be within 50 ft, and may contribute some error to the correlation to the seismic data.

The seismic refraction results indicate that the seismic velocity of the bedrock along the line is relatively high between stationing 820 ft. and 1490 ft., and also between stationing 0 ft. and -350 ft., and relatively low between stationing 0 ft. to 1200 ft. (Sheet 3). The highest bedrock velocity (8,500 ft./second) is observed between 820 ft. and 1200 ft. with the lowest velocity (5,800 ft./second) between 260 ft. and 820 ft. It should be noted that all these velocities are considered to be at the low end of the range for bedrock material (i.e. low strength). This is likely due to the highly weathered and altered nature of the bedrock throughout the profile area.

These refraction results show reasonable correlation to the borehole data. The logs for Boreholes SBH-3 and SBH-5 indicate bedrock with relatively high blow counts, and these boreholes project onto the refraction line in the area of relatively high seismic velocity (Sheet 3). In addition, Boreholes SBH-3 and SBH-5 lie within one of the interpreted dike-like structures (Sheet 3). The logs for Boreholes SBH-1, SBH-2, and SBH-6 indicate bedrock with relatively low blow counts and these boreholes project onto the refraction line in the area of relatively low seismic velocity. In fact, the blow counts recorded for the bedrock at Borehole SBH-1 are similar to the blow counts recorded for the overlying sediments. This is consistent with the low seismic velocity along this portion of the refraction line, which was measured at 5,800 ft./second and is more typical of a velocity for saturated sediments. To put this velocity into perspective, a velocity of 5,500 ft./second was used to scale the depth of sediment off the seismic reflection records.

The relatively high seismic velocity of the bedrock from 820 ft. to 1490 ft. is also in reasonable correlation with the interpreted dike-like structures located at the southwest end of the site (Sheet 3). These results suggest that the bedrock at the location of these dike-like structures, and the bedrock at the southwest end of the site in general, may be more competent than the bedrock in the northeast portion of the site. There is no intrusive information to evaluate the higher seismic velocity of the bedrock measured at the northeast end of the refraction line between 0 ft. and -350 ft, however, the seismic velocity values suggest that more competent bedrock may be present here as well. A generalized map of the interpreted onshore geology from the Woodward-Clyde report (May, 1985), however, does indicate a zone of slightly weathered to competent bedrock mapped on shore in this area of higher velocities at the northeast end of the refraction line. Similar zones of slightly weathered to competent bedrock were mapped on shore at the southwest end of the site, near Black Point, and correlate to the higher velocities measured at that end of the site.

The locations of all five test pits are projected onto the refraction line in the area of low to moderate bedrock velocity between 0 ft. and 820 ft. (Sheet 3). Test pits TP-1 and TP-2 are located in the area of lowest bedrock velocity. The logs indicate easily excavatable sediments and weathered bedrock material to the bottom of the test pits at 11 and 14 ft, respectively. This easily excavatable material type is consistent with the low seismic velocity values measured in this area. Test pits TP-3 and TP-4 project onto the refraction line near the transition from 5,800 ft./second and 6,550 ft./second bedrock velocities. These test pits encountered refusal at 2.5 and 4.5 feet, respectively. This suggests that the 6,550 ft./second velocity material may not be readily mechanically excavatable by, or perhaps that the lateral variability in the bedrock material is significant over the distance between the refraction line and these test pit locations. Test pit 5, located near the transition from 6,550 ft./second to 7,550 ft./second bedrock, logged easily excavatable sediment and weathered bedrock to 14 ft. and difficult excavating below that depth.

The correlation between these preliminary geophysical results and the borehole/test pit data, combined with the good overall quality of the data, give us a relatively high level of confidence in the interpretation. However, it should be noted that the seismic refraction method measures the velocity of a volume of material beneath the profile line and only beneath the profile line. Therefore, small scale heterogeneity in the subsurface materials beneath the refraction line may not be detected. In addition, lateral changes in subsurface material away from the refraction line will not be detected with the seismic refraction method.

6. GEOLOGICAL INTERPRETATION AND EXPECTED MATERIAL TYPES

The borehole data indicate that the sedimentary material overlying the bedrock consists predominantly of silty sand with some gravel with potentially more cobbles in the vicinity of the seafloor rise near boreholes SBH-5. These borehole data are consistent with the seismic reflection data which show continuous layering and some crossbedding, typical of finer grained material, within the sediments overlying bedrock. However, numerous diffraction patterns in the near surface are observed on the seismic reflection data in the area of shallow water and shallow bedrock between Test Pit TP-1 and Borehole SBH-5. These diffraction patterns are indicative of cobbles and boulders and are consistent with the boulders observed on the seafloor and the heavy kelp growth in this area that is often associated with the presence of boulders or exposed bedrock. The test pits indicate that the near shore sediments consist predominantly of a thin layer of cobbles and boulders underlain by silty sand and sandy clay. The borehole logs indicate the bedrock is volcanic with a highly variable degree of weathering and competency.

7. SUMMARY AND CONCLUSIONS

A marine geophysical survey was conducted at the proposed southwest expansion of Humboldt Harbor in Sand Point, Alaska. The survey consisted of high-resolution continuous seismic reflection profiling to map the top of bedrock and seismic refraction to assist in estimating the competency of the bedrock across the site. Positioning of the survey vessel was done with differential GPS. Data from 6 boreholes and 5 test pits from two previous investigations were used to assist and evaluate the geophysical interpretation.

Contour maps of the interpreted top-of-bedrock surface and sediment thickness (isopach) were produced.

The thickness of unconsolidated sediment overlying bedrock ranged from less than 5 ft. to a maximum of 55 ft. The bedrock reflector was distinct over much of the site, however, it was difficult to clearly identify a 'contact' between unconsolidated material and the top of bedrock in the shallow water areas or where the sediments were less than 5 ft thick. In these areas the weathered zones in the bedrock, or large cobbles and boulders, either scatter the energy or do not have a significant acoustic contrast relative to the underlying bedrock. A good correlation was observed between the interpreted bedrock surface from the geophysical data and the borehole logs at most locations.

Possible dike-like features were interpreted from the seismic reflection data, extending off shore in the vicinity of Black Point. These dike-like features correlate reasonably well with the relatively high bedrock velocities measured with seismic refraction in the southwest portion of the site and the blow count data on the borehole logs. A good correlation was also observed between the measured seismic velocity of the bedrock and the blow count data on the borehole logs.

The borehole data and the seismic reflection data both suggest that the sediments overlying the bedrock are predominantly fine grained (silty sand with some gravel), with the exceptions of one area of shallow bedrock and the intertidal zone where the sediments appear to contain more cobbles and boulders.

Correlation of the subsurface information with the seismic velocities suggests that bedrock with velocities exceeding about 6000 ft/sec may require blasting. If mechanical dredging is contemplated for materials exceeding 6000 ft/sec, the equipment should first be tested onsite.

8. CLOSURE

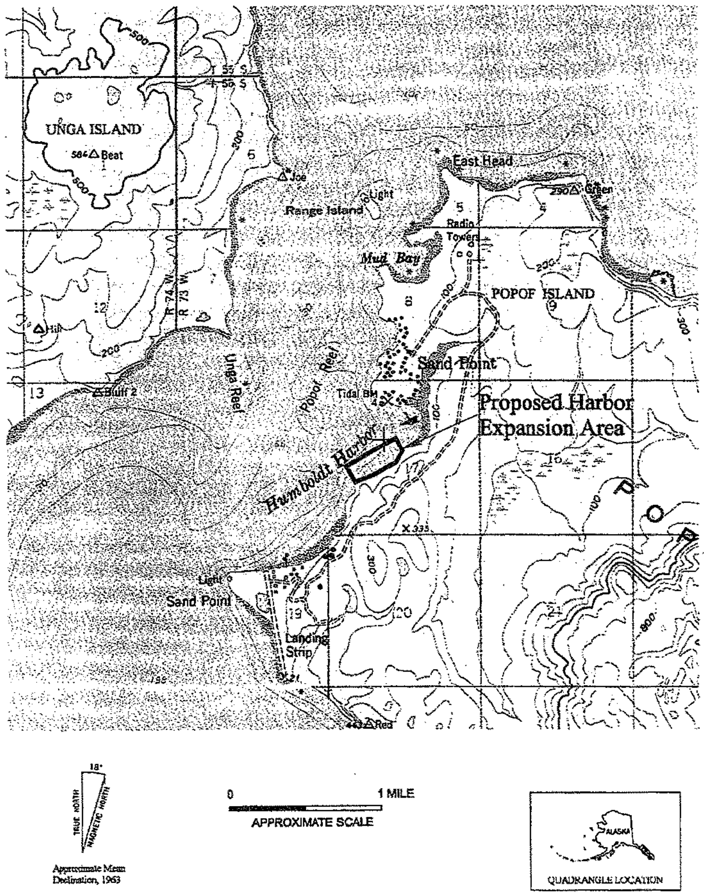
While Golder Associates uses the due standard of care recognized in the industry for this type of survey, conditions may exist which do not allow subsurface structure to be resolved by geophysical methods or can cause geophysical data to be misinterpreted. Therefore, it is always a possibility that actual subsurface conditions may differ significantly from subsurface conditions interpreted from geophysical data.

9. REFERENCES

1. Burk, C.A., 1965, Geology of the Alaska Peninsula--Island Arc and Continental Margin, Geological Society of America, Mem. 99 pt.1, p. 250.

2. U.S. Army Corps of Engineers, 1997, Testpit Logs.

3. Woodward-Clyde Consultants, April 1985, Geotechnical Investigation of Small Boat Harbor, Sand Point, Alaska.



REFERENCE: U.S.G.S. TOPOGRAPHIC MAP TITLED "PORT MOLLER (B-2), ALASKA", 1:63:360.

FIGURE 1

PROJECT LOCATION MAP

COE / HUMBOLDT HARBOR MARINE SURVEY / AK

JOB NUMBER: 973-5287x005 FILE NAME: VICINMAP.CRD DATE: 8/97 DRAWN: APG

Golder Associates

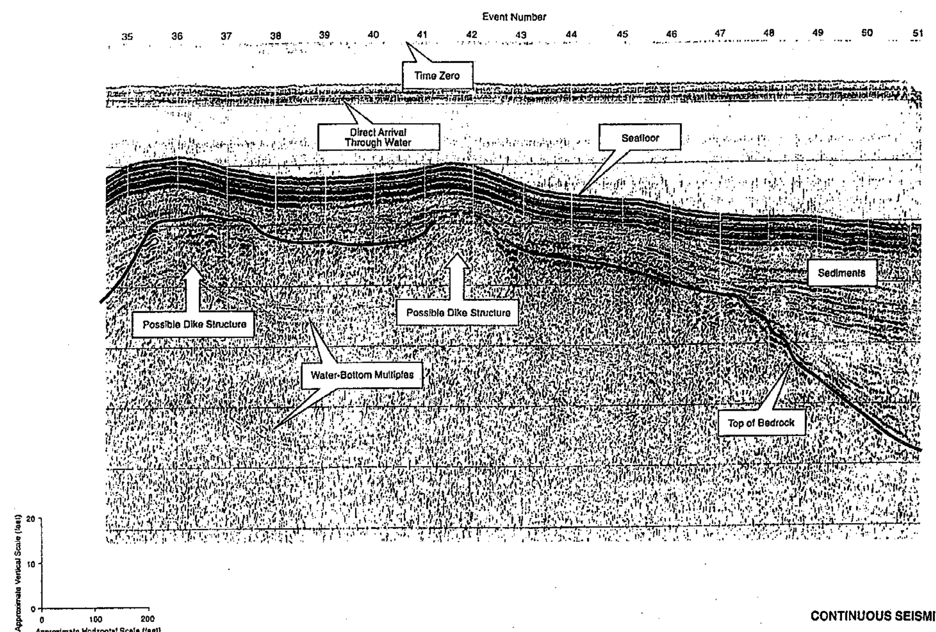


FIGURE 2

CONTINUOUS SEISMIC REFLECTION RECORD
LINE 3
HUMBOLDT HARBOR, SAND POINT, ALASKA
ACOE/SAND POINT/AK

PROJECT NO. 973 5287/005 000 DRAWING NO. 78124 DATE 9/2/97 DRAWN BY TK

Golder Associates

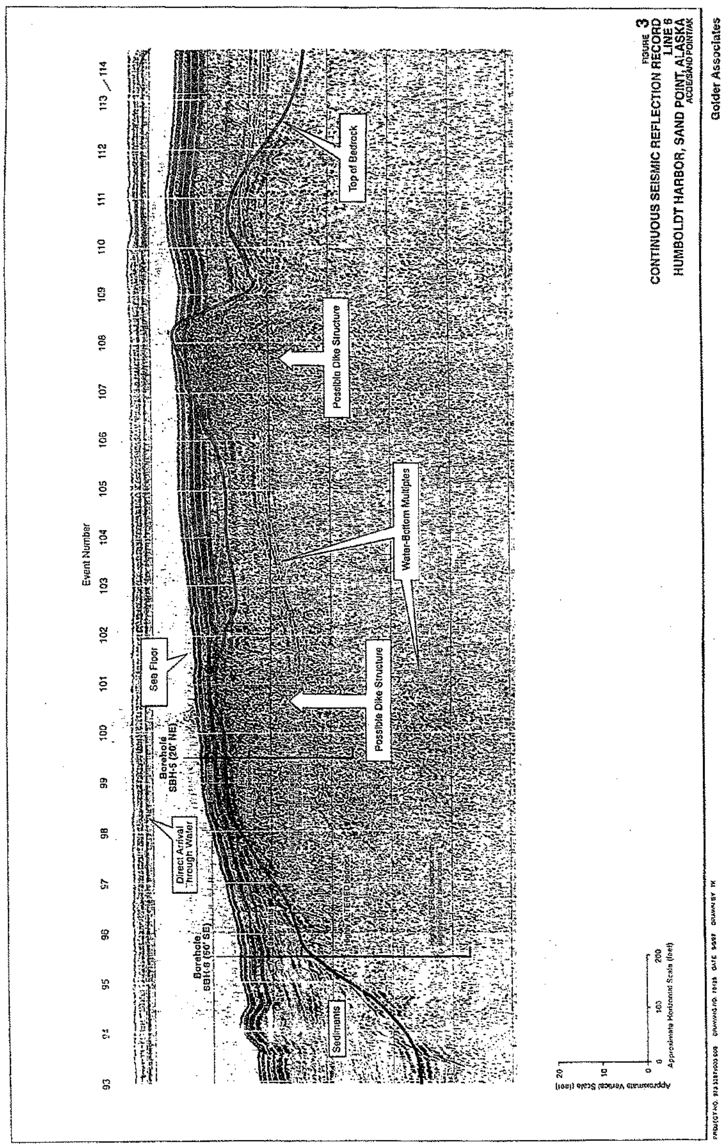


FIGURE 3
CONTINUOUS SEISMIC REFLECTION RECORD
LINE 6
HUMBOLDT HARBOR, SAND POINT, ALASKA

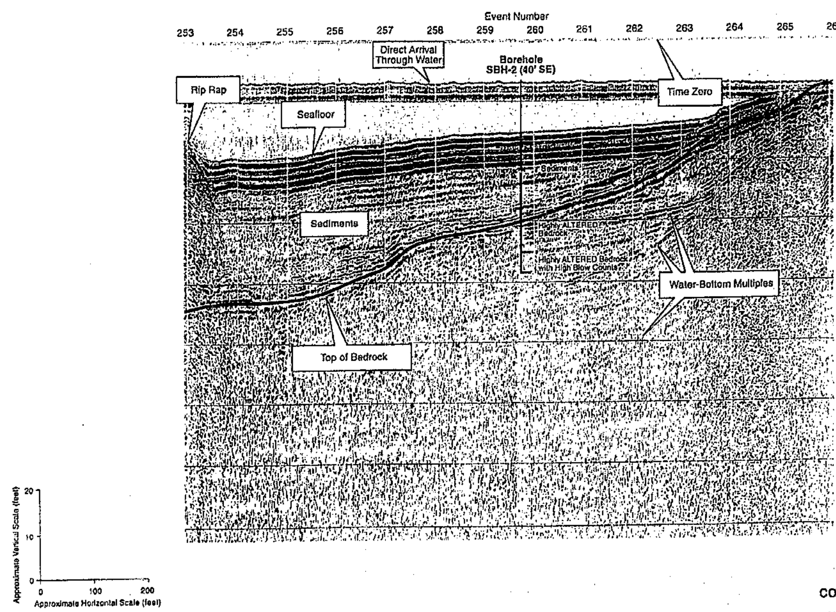


FIGURE 4
CONTINUOUS SEISMIC REFLECTION RECORD
LINE 15
HUMBOLDT HARBOR, SAND POINT, ALASKA
ACOE/SAND POINT/AK

PROJECT NO. 973-5287/005.000 DRAWING NO. 78126 DATE 9/3/97 DRAWN BY TK

Golder Associates

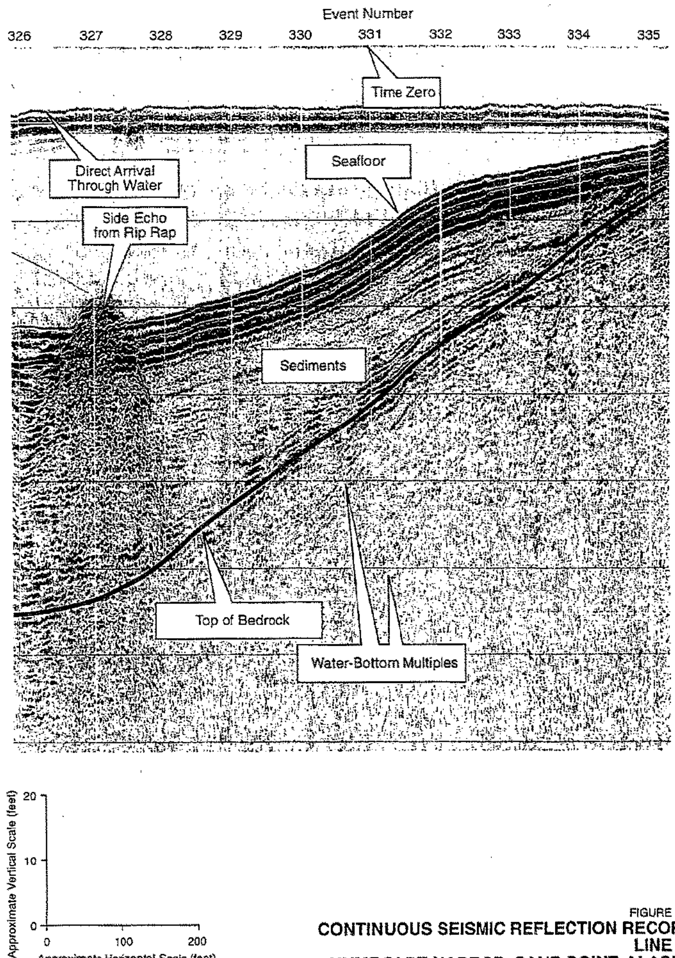


FIGURE 5
CONTINUOUS SEISMIC REFLECTION RECORD
LINE 30
HUMBOLDT HARBOR, SAND POINT, ALASKA
ACOE/SAND POINT/AK

PROJECT NO. 973 5287x035.000 DRAWING NO. 78127 DATE 9/3/97 DRAWN BY TK

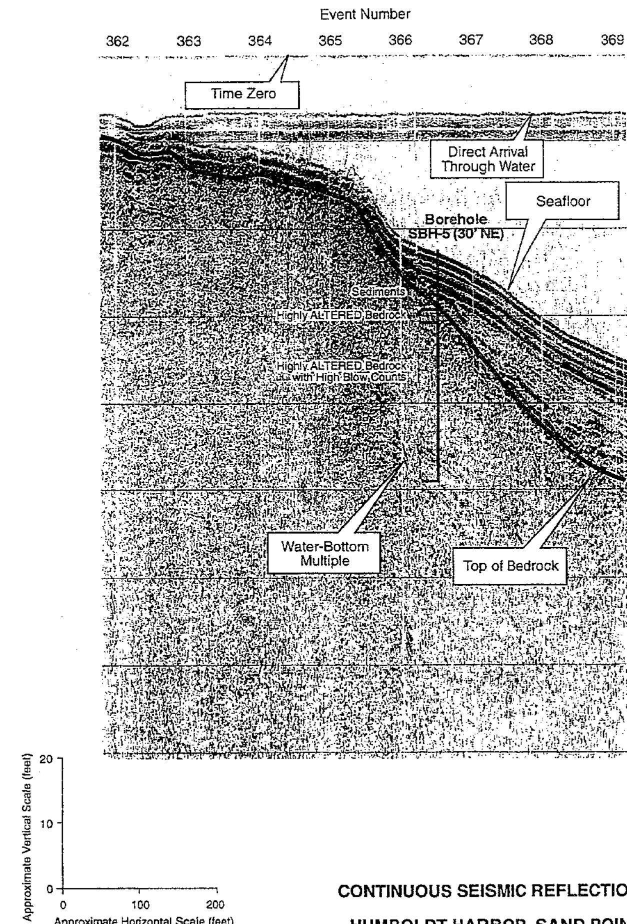


FIGURE 6
CONTINUOUS SEISMIC REFLECTION RECORD
LINE 27
HUMBOLDT HARBOR, SAND POINT, ALASKA
ACOE/SAND POINT/AK

PROJECT NO. 973 5287x005.000 DRAWING NO. 78128 DATE 9/2/97 DRAWN BY TK

Golder Associates

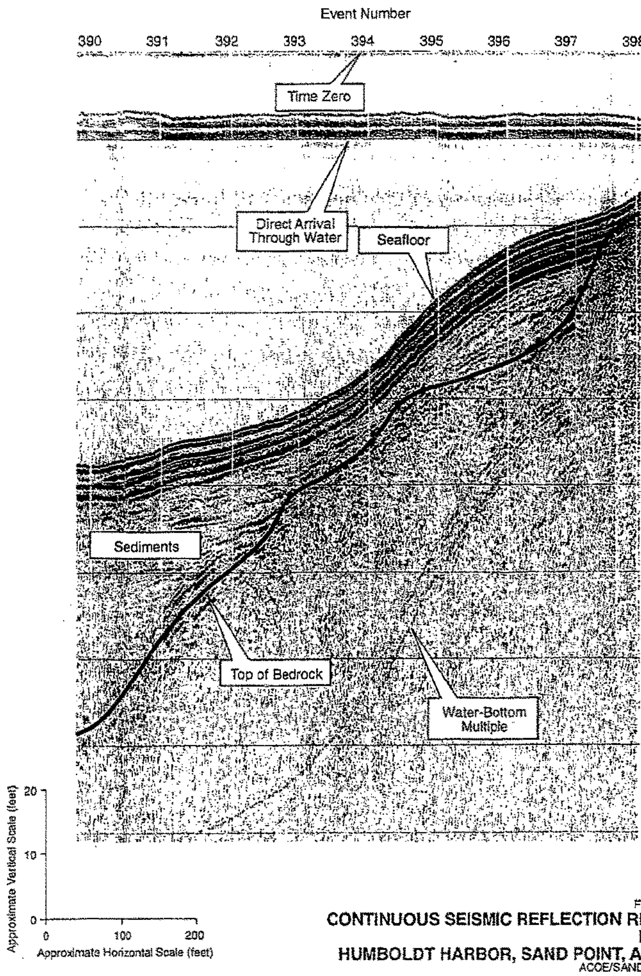
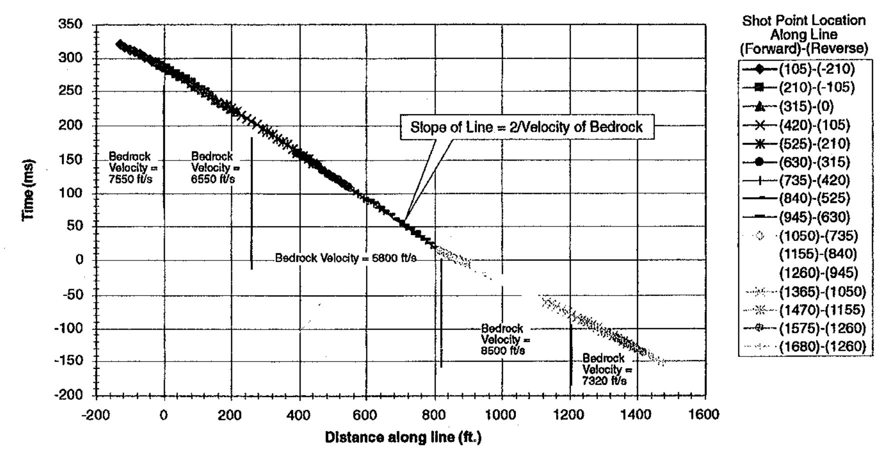


FIGURE 7
CONTINUOUS SEISMIC REFLECTION RECORD
LINE 24
HUMBOLDT HARBOR, SAND POINT, ALASKA
ACOE/SAND POINT/AK

PROJECT NO. 973 5287x005.000 DRAWING NO. 78129 DATE 9/3/97 DRAWN BY TK

Golder Associates

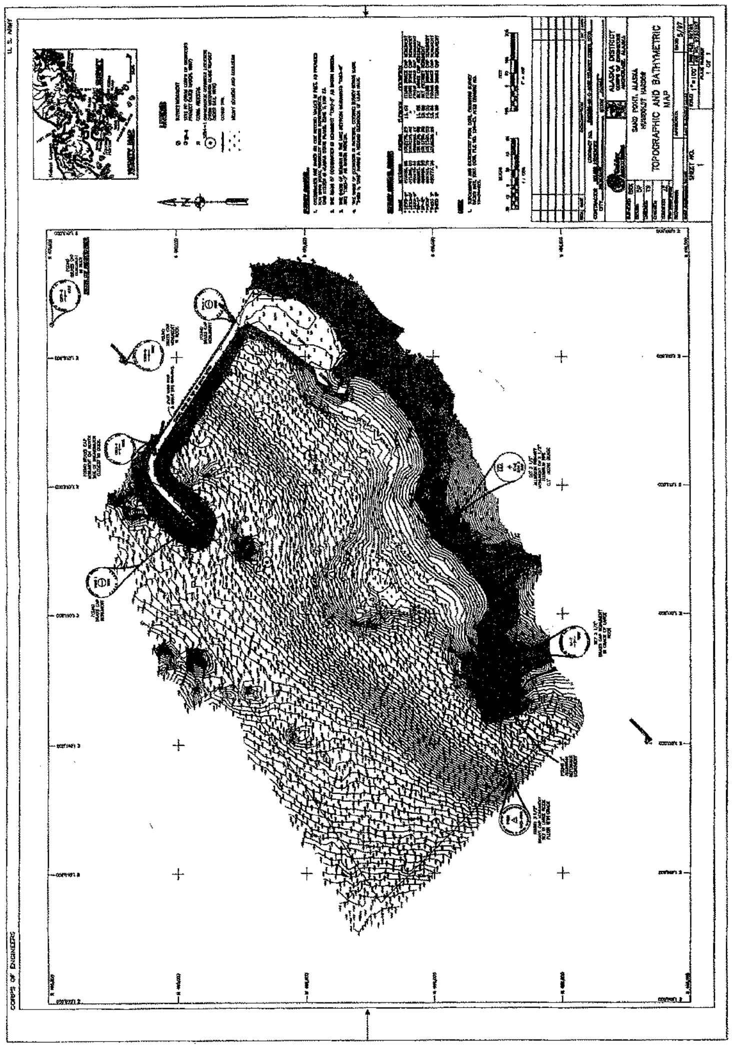


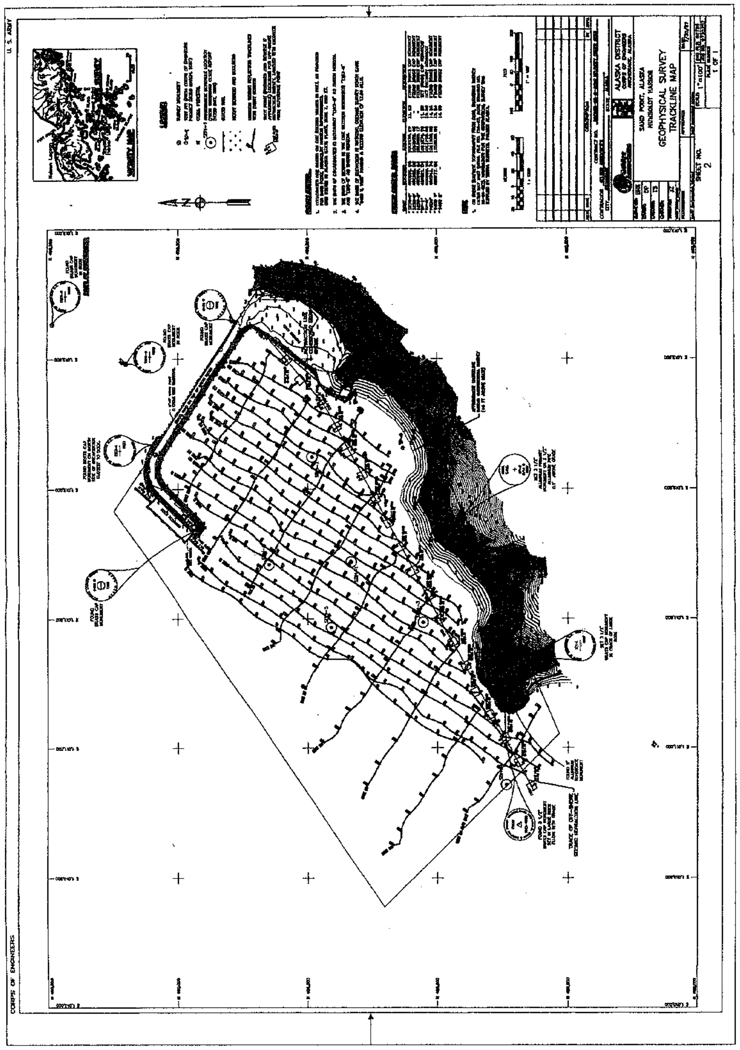
NOTE: Refer to Sheets 2 and 3 for Seismic Refraction Line Location and Interpretation.

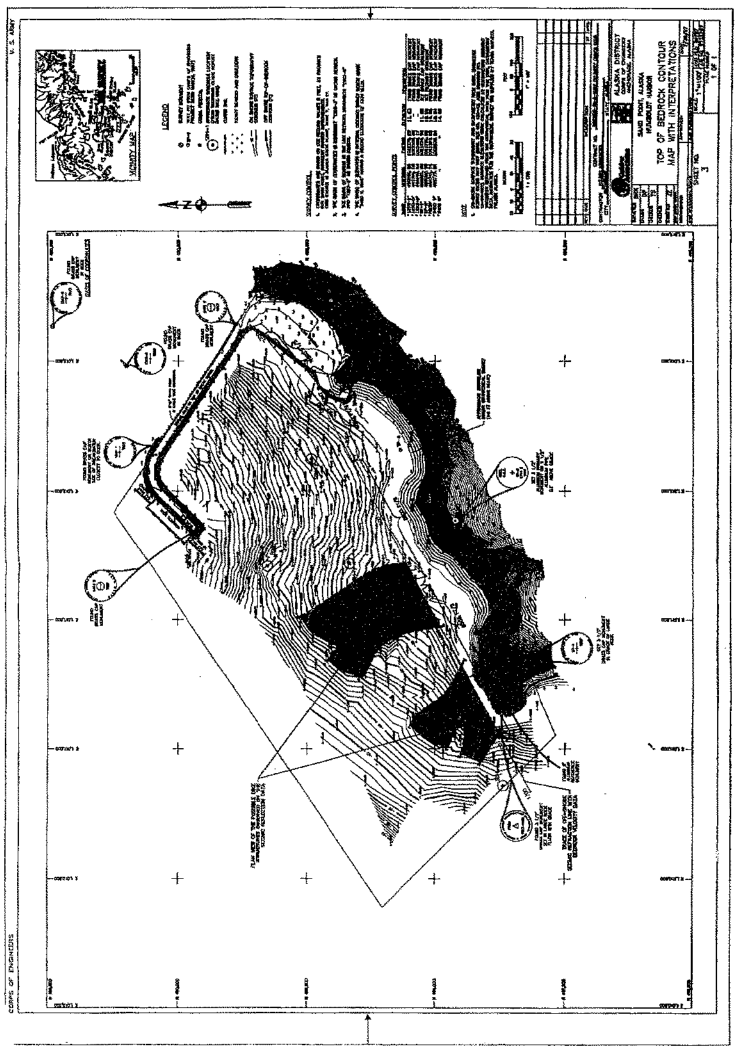
FIGURE 8
DIFFERENCE IN ARRIVAL TIME PLOT
SEISMIC REFRACTION LINE
HUMBOLDT HARBOR, SAND POINT, ALASKA
ACOE/SAND POINT/AK

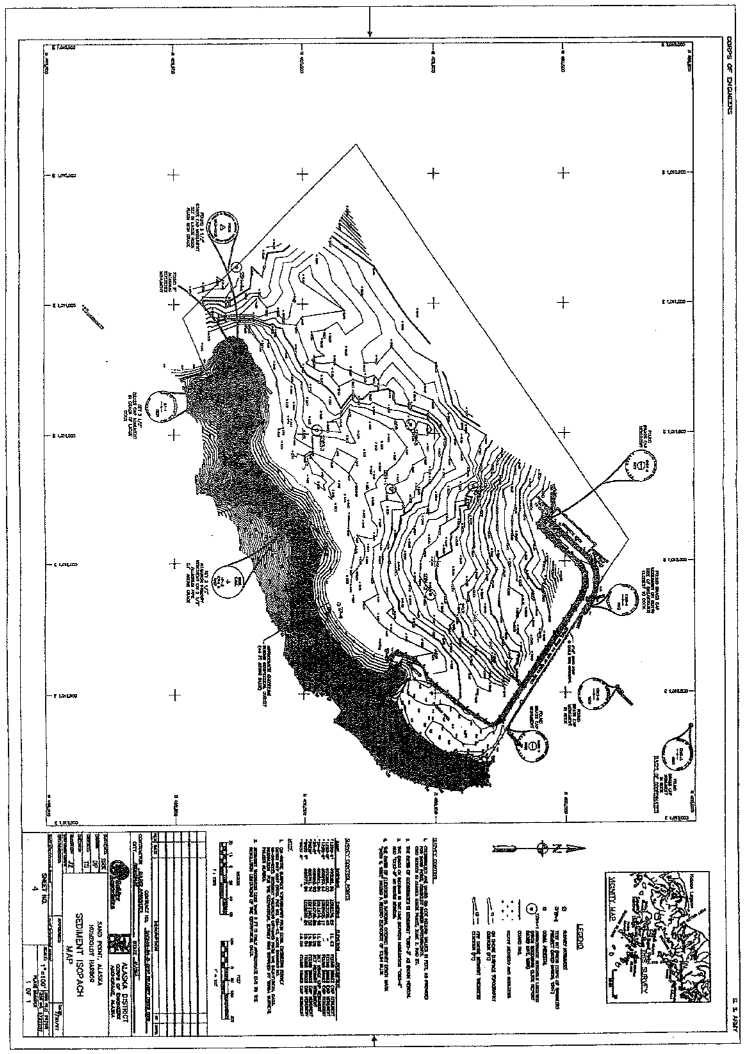
PROJECT NO. 973 5287x005.000 DRAWING NO. 78130 DATE 6/3/97 DRAWN BY TK

Golder Associates


ALASKA DISTRICT
SAND POINT, ALASKA
TOPOGRAPHIC AND BATHYMETRIC
MAP
SHEET NO.
1
1 OF 1
1"=100'
CORPS OF ENGINEERS
U. S. ARMY


U. S. ARMY
CORPS OF ENGINEERS
ALASKA DISTRICT
SAND POINT, ALASKA
GEOPHYSICAL SURVEY
TRACKLINE MAP


U. S. ARMY
CORPS OF ENGINEERS
LEGEND
VICINITY MAP
ALASKA DISTRICT
SAND POINT, ALASKA
HUMBOLDT HARBOR
TOP OF BEDROCK CONTOUR
MAP WITH INTERPRETATIONS



APPENDIX D

CHEMICAL DATA REPORT

Chemical Data Report

Pre-Dredge Sediment Sampling

Humboldt Harbor Expansion, Sand Point, Alaska

June 1997

PREPARED BY THE

ALASKA DISTRICT, U.S. ARMY CORPS OF ENGINEERS

MATERIALS AND INSTRUMENTATION SECTION

GEOTECHNICAL BRANCH

2 September 1997

CHEMICAL DATA REPORT
SAND POINT, ALASKA

EXECUTIVE SUMMARY

This chemical data report has been prepared by the Materials and Instrumentation Section of the U.S. Army Corps of Engineers, Alaska District (CEPOA-EN-G-MI), to present the results of the pre-dredge sediment investigation performed in June 1997. It describes the field procedures used and analytical results obtained during the preconstruction investigation for the Humboldt Harbor expansion project near Sand Point, Alaska.

All samples were collected by Richard Ragle of CEPOA-EN-G-MI and were submitted to laboratories for analysis. The samples were tested for volatile organic compounds, semi-volatile organic compounds, organochlorine pesticides, polychlorinated biphenyls, 8-RCRA metals, copper, sulfate, nitrate-nitrite, and total organic carbon.

Results indicate that the sediment proposed for dredging is not contaminated. The MDL's (Method Detection Limits) obtained, for the vast majority of analytes, are well below associated action levels and sediment management criteria. The proposed dredge material appears to be chemically suitable for beneficial use, upland disposal, or ocean disposal.

CHEMICAL DATA REPORT

CONTENTS

APPENDIXES – Appendixes referenced in this report have been omitted. Copies may be obtained by contacting the Alaska District's Environmental Resources Section at (907) 753-2736.

FILENAME: APPDCDR.DOC
January 13, 1998

CHEMICAL DATA REPORT
SAND POINT, ALASKA

1. INTRODUCTION

This chemical data report has been prepared by the Materials and Instrumentation Section of the U.S. Army Corps of Engineers, Alaska District (CEPOA-EN-G-MI), to present the results of the pre-dredge sediment investigation performed in June 1997. It describes the field procedures used and analytical results obtained during the preconstruction investigation for the Humboldt Harbor expansion project near Sand Point, Alaska.

2. BACKGROUND INFORMATION

2.1 Location

The proposed site of the harbor expansion project is adjacent to and southwest of the current small boat harbor at Sand Point. Sand Point is on the western portion of Popof Island, which is located south of the Alaska Peninsula (see figures 1 and 2). Access to the community is through scheduled commercial air service.

2.2 History

Sand Point was founded in 1898 as a trading post and cod fishing station. Aleuts from surrounding villages and Scandinavian fishermen were the first residents of the community. Sand Point served as a repair and supply center for gold mining during the early 1900's, but fish processing became the dominant activity in the 1930's. Today, it is home to the largest fishing fleet in the Aleutian Chain. Trident Seafoods has a major bottomfish and salmon plant and also provides fuel and other services. Peter Pan Seafoods owns a storage and transfer station. In 1991, New West Fisheries moored a floating processor near the city dock for Pacific cod processing. One hundred twenty-six local residents hold commercial fishing permits.

Construction of the existing harbor (Humboldt Harbor) was completed in July 1976. The current harbor provides protected moorage for about 230 local and transient fishing boats and is also a harbor of refuge for commercial fishing vessels in the Alaska Peninsula region. Maintenance dredging operations removed 817 cubic yards of sediment material from the harbor in 1993. Samples were collected for chemical analysis prior to dredging operations and were tested for volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), the eight metals regulated under the Resource Conservation and Recovery Act (RCRA), total organic carbon (TOC), total solids, polychlorinated biphenyls (PCB's) and chlorinated pesticides. Results from the pre-dredging investigation indicate the presence of the semivolatile organic compound fluoranthene in the inner harbor sediment and the metal cadmium throughout the harbor sediment at levels above minimum management levels. The area of the harbor with elevated fluoranthene was not dredged. Only the entrance channel and the area just outside the harbor were dredged.

2.3 Regional Geology

Popof Island has varied terrain, with rugged mountains to the east and a broad lowland valley to the west. Most lowland slopes are covered with unconsolidated sediments, brush and tundra; however, bedrock is generally well exposed at higher elevations and along the sea cliffs that bound much of the island. Although tertiary sedimentary rocks crop out on the northwest, the island is primarily composed of tertiary volcanic rocks.

The shoreline of the proposed harbor expansion area is characterized by steep wave-cut slopes of volcanic bedrock overlain by 2-4 feet of sandy silt and organics above 20 feet mean lower low water (MLLW). Beaches composed of sand, cobbles, and boulders have formed seaward of these outcrops.

3. PROJECT ORGANIZATION

Project Formulation Section (CEPOA-EN-CW-PF) requested that CEPOA-EN-G-MI conduct an investigation of the sediments at the proposed site of the harbor expansion. CEPOA-EN-G-MI was responsible for development of a Sampling and Analysis Plan (SAP), execution of the investigation, and reporting the results.

4. INVESTIGATION STRATEGY

4.1 Investigation Objectives

Samples for chemical and mechanical analysis were collected to detect potential contaminants and characterize the proposed dredge material for upland and/or ocean disposal. It is anticipated that a beneficial upland use can be found for all of the uncontaminated material dredged during this project.

4.2 Sampling Locations

Five sediment samples were collected and analyzed as described in the Work Plan. All five samples are from the portion of the site that will require dredging. Triplicate samples 97SPHE-03SL, -04SL and –05SL were collected near the discharge of an intermittent stream that runs through the landfill (see figure 2). No background samples were collected. In the figure, sample locations are indicated by a two-digit number. For example, sample number 97SPHE-03SL is identified on the figure by 03.

4.3 Sample Analysis

All of the samples were submitted to contract laboratories for chemical analysis. Primary samples, including two of the three duplicate samples, were analyzed by LAS Laboratories, Las Vegas, Nevada. One duplicate sample was analyzed by Columbia Analytical Services, Inc., Anchorage, Alaska (CAS-AK), and Columbia Analytical Services, Inc., Kelso, Washington (CAS-K). Duplicate samples for chemical analysis were submitted and analyzed to provide an indicator of inter-laboratory and intra-laboratory variability of analytical results. All mechanical analyses were performed by Alaska Testlab, Inc., Anchorage, Alaska. Table 1 summarizes the analyses that were performed on the samples.

TABLE 1.—*Sample analyses*

Chemical characterization	
Analyte	**Analytical method**
Total Organic Carbon (TOC)	9060
Volatile Organic Compounds (VOC)	8260A
Semi-volatile Organic Compounds (SVOC)	8270B
8 RCRA Metals + Cu	6000-7000 Series
PCBs & Pesticides	8080A/8081
Nitrate + Nitrite	300.0
Sulfate	300.0
Mechanical characterization	
Analyte	**Analytical method**
Particle-size Distribution	ASTM D-2487

5. SAMPLING PROCEDURES

5.1 Field Activities

All sediment samples were collected by Richard Ragle of CEPOA-EN-G-MI. Submerged sediment samples (97SPHE-01SL and -02SL) were collected using the city of Sand Point's fire/rescue boat and a Peterson dredge. Samples -03SL through -07SL (including the triplicate set composed of samples -03SL, -04SL and -05SL) were collected from the beach during a low tide using a shovel. A new pair of nitrile gloves and a new stainless steel spoon were used to fill the sample jars. The general procedure followed for the collection of sediment samples for this project is as follows:

1. Determine sampling locations referencing existing landmarks located in the area and/or location markers on shore.

2. Measure and record physical water quality parameters (conductivity, salinity, turbidity, pH, temperature, oxidation-reduction potential, and dissolved oxygen) at 5-foot intervals from the water surface to the surface of the sediment to be sampled.

3. Drive the sampling device into the sediment.

4. Retrieve the sampling device.

5. Collect the sample for VOC analysis directly from the sampling device.

6. Transfer the contents of the sampling device into a clean stainless steel pan.

7. 7. If enough material to fill the remaining sample containers was obtained, homogenize the sample and fill the sample containers from the pan. If more material is required, immediately re-drive the sampling device until enough material is obtained. Then, homogenize the sample and fill the remaining containers in descending order of volatility.

8. Immediately place the samples into a cooler with sufficient ice to maintain the samples at 4°C ± 2°C.

9. Decontaminate all reusable sampling equipment before proceeding to next sampling location (see section 5.3). Decontaminated sampling equipment was stored in clean plastic bags until needed.

5.2 Field Measurements

Physical water quality parameters were measured and recorded at each sample location. Measurements were collected at 5-foot intervals between the water surface and the ocean floor. Pertinent information related to the samples including water quality parameters, depth of sample, tidal conditions, color, odor or other observable sample characteristics, any organisms retrieved with the sample, precise location of sample, time of collection, sample number and the number of times the sampling device was driven to obtain sufficient sample are provided in the Trip Report included in appendix C.

5.3 Equipment Decontamination

To prevent potential cross-contamination, all equipment that was reused was decontaminated between sample locations. The shovel, stainless steel pan, and Peterson dredge were decontaminated as described below. Stainless steel spoons and sample containers are single-use items and were discarded after each sample.

Decontamination Procedure.

1. Remove visible particulates, with a brush and seawater.
2. Wash in warm, soapy water.
3. Rinse with potable water.
4. Rinse with small amount of methanol. Air dry.
5. Rinse with deionized water.
6. Rinse with small amount of hexane. Air dry.
7. Rinse with deionized water.
8. Rinse with small amount of nitric acid solution.
9. Rinse with deionized water. Air dry.

5.4 Investigation-Derived Waste

Methanol and hexane rinsate was collected in a shallow pan and allowed to evaporate. The nitric acid solution rinsate was combined with the soapy water, potable water rinsate, and deionized water rinsate, then disposed of through the city's sewer system.

6. ANALYTICAL RESULTS

All analytical results are provided in appendix A. The State of Alaska has not promulgated any applicable standards to specifically regulate the use and/or disposal of potentially contaminated sediments. In the absence of such standards, this report compares analyte method detection limits (MDL's) and reported concentrations to State of Washington, Department of Ecology, Marine Sediment Quality Standards (MSQS's) and State of Washington, Department of Natural Resources, Screening Levels (SL's) and Maximum Levels (ML's) from their Puget Sound Dredged Disposal Analysis (PSDDA) Report. MSQS's and SL's allow comparison of MDL's and reported concentrations to conservative reference concentrations that have not been shown to cause an observable adverse impact on marine organisms. ML's are established at the highest apparent effects threshold for a range of biological indicators. For most MSQS's and some SL's and ML's, reported concentrations and MDL's must be normalized to compensate for total organic carbon (TOC) concentrations. This is accomplished by dividing the reported concentration or MDL by the decimal representing the percent TOC contained in the sample.

In order to determine the feasibility of the upland use and/or disposal options that are preferred at this site, reported concentrations and MDL's are also compared to levels provided in the U.S. Environmental Protection Agency's (EPA) Region III Risk Based Concentration (RBC) Table. The table provides 10^{-6} human health-risk data that are based on conservative exposure scenarios. The RBC's presented are based on the residential soil ingestion scenario.

An independent evaluation of laboratory data quality was performed by ETHIX, Inc., of Modesto, California. A copy of the resulting Laboratory Data Quality Report is provided in Appendix B.

6.1 Volatile Organic Compounds

All of the samples were analyzed for volatile organic compounds (VOC's) by method 8260A. VOC results are presented in table 1 of appendix A. All of the VOC results associated with the duplicate sample analyzed by CAS-K (97SPHE04SL) are considered to be low estimates because the sample shipment from CAS-AK was received at 7.6 °C (1.6 degrees above the required range of 4° +/- 2 °C).

Low levels of acetone and/or 2-butanone were reported in samples -01, -02, -06 and -07 at estimated concentrations up to 8.3 and 2.8 ug/kg, respectively. These compounds are common laboratory contaminants, and their presence at the reported levels is attributable to post-collection contamination. All of the reported VOC concentrations are considered estimates because the levels reported are below levels that could be accurately quantified.

There are no MSQS's, SL's, or ML's associated with acetone or 2-butanone. The RBC's associated with residential soil (the most conservative) for acetone and 2-butanone are 7800 mg/kg and 4700 mg/kg, respectively. All reported concentrations and MDL's are well below their associated RBC's for residential soil. All reported and TOC-normalized MDL's and detected concentrations are below associated SL's and MSQS's.

6.2 Semivolatile Organic Compounds

All of the samples were analyzed for semivolatile organic compounds (SVOC's) by method 8270B. SVOC results are presented in table 2 of appendix A. All of the SVOC results associated with the duplicate sample analyzed by CAS-K (97SPHE04SL) are considered to be low estimates because the shipment from CAS-AK was received at 7.6 °C (1.6 degrees above the required range of 4° +/- 2 °C).

The SVOC, 4-methylphenol, was reported in the duplicate sample that was analyzed by CAS-K at an estimated 0.2 µg/kg. It was also reported in the associated method blank and is attributed to laboratory contamination. No other SVOC's were detected in any of the samples. All reported MDL's are below associated RBC's. All reported and TOC-normalized MDL's for analytes tested were below associated MSQS's, with the following exceptions: 2,4-dimethylphenol, 2-methylphenol, and benzyl alcohol for all samples; and 4-methylphenol, hexachlorobenzene, and pentachlorophenol for samples -03, -05, -06 and –07. The MDL's obtained by LAS often exceeded the SL's for many of the SVOC analytes and were above the ML for at least one sample for each of the following analytes: 1,2,4-trichlorobenzene, 2,4-dimethylphenol, 2-methylphenol, benzyl alcohol, and hexachlorobenzene. MDL's obtained by CAS-K exceeded ML for 2-methylphenol. LAS did not analyze the samples for Nnitrosodimethylamine; thus the only data obtained for this analyte is from the duplicate sample analyzed by CAS-K.

Very low TOC concentrations in the samples collected from the beach (-03, -04, 05,-06 and -07), contributed to some elevated TOC-normalized detection limits. Though many of the MDL's exceeded reference levels, the absence of other related contaminants indicates that it is very unlikely that undetected concentrations of SVOC analytes above sediment management criteria are present at the site.

6.3 Organochlorine Pesticides and PCB's

LAS and CAS-K analyzed the samples for organochlorine pesticides and polychlorinated biphenyls (PCB's) by methods 8080A and 8081, respectively. The two analyses are similar, and the results are comparable. Pesticide and PCB results are presented in table 3 of appendix A. Results for sample 97SPHE01SL are considered to be low estimates based on low surrogate recoveries.

No organochlorine pesticides or PCB's were detected in any of the samples. All reported MDL's are below associated residential RBC's for soil. All TOC-normalized MDL's are below associated SL's and MSQS's.

6.4 Total Metals

All of the samples were analyzed for arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium and silver. Total metal concentrations are presented in table 4 of appendix A.

No cadmium, mercury, selenium, or silver was detected in any of the samples. Arsenic, barium, chromium, copper, and lead were reported at concentrations up to 19, 16, 16.9, 20.1, and 5.9 mg/kg, respectively. All reported concentrations and MDL's are below associated RBC's, SL's, and MSQS's.

6.5 Nitrate-Nitrite, Sulfates, and Total Organic Carbon

All of the samples were analyzed for nitrate-nitrite, sulfates, and TOC content. Results are presented in table 5 of appendix A.

Nitrate-nitrite, sulfates, and TOC are not regulated as contaminants. However, their presence and relative concentrations provide additional information to help characterize the site and gauge the "general health" of the sediment environment. The relatively low levels of TOC reported in some samples are likely due to the general lack of fine material in the samples. No other notable deviations from expected concentrations were reported.

6.6 Particle-Size Distribution

All of the samples were submitted to Alaska Testlab for particle-size distribution analysis. Results are presented in table 6 of appendix A.

The particle-size distribution results ranged from silty sand (SM) in sample -01SL to poorly graded sand with gravel (SP) in samples -02SL, -03SL and -06SL. No duplicate samples were collected for particle-size distribution. The relatively large particle sizes predominant at this site contribute to the unlikelihood that the sediment will be a carrier of contaminants.

7. CONCLUSIONS

The lack of detected contaminants at the site indicates that the sediment proposed for dredging is not contaminated. The MDL's obtained, for the vast majority of analytes, are well below associated RBC's, SL's, ML's and MSQS's. The proposed dredge material appears to be chemically suitable for beneficial use, upland disposal, or ocean disposal.

REFERENCES

a. U.S. Army Corps of Engineers (USACE). 1996 (Apr). "Chemical Data Quality Management for Hazardous Waste Remedial Activities," ER 1110-1-263.

b. USACE, Alaska District. 1996 (Apr). "Reconnaissance Report for Boat Harbor Improvements, Sand Point, Alaska."

c. USACE, Alaska District. 1990. "Rivers and Harbors Navigation and Flood Control, Project and Index."

d. USACE, Alaska District. 1997 (May). "Work Plan, Sand Point Small Boat Harbor Expansion."

e. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. 1994 (Sep). "Test Methods for Evaluating Solid Wastes," SW-846, Third Edition.

f. U.S. Environmental Protection Agency. 1991 (Feb). "Evaluation of Dredged Material Proposed for Ocean Disposal - Testing Manual," EPA 503/8-91/001..

g. Washington State, Department of Ecology. 1995 (Dec). *Sediment Management Standards*, chapters 173-204.

h. Washington State, Department of Natural Resources. 1988 (Jun). "Puget Sound Dredged Disposal Analysis."

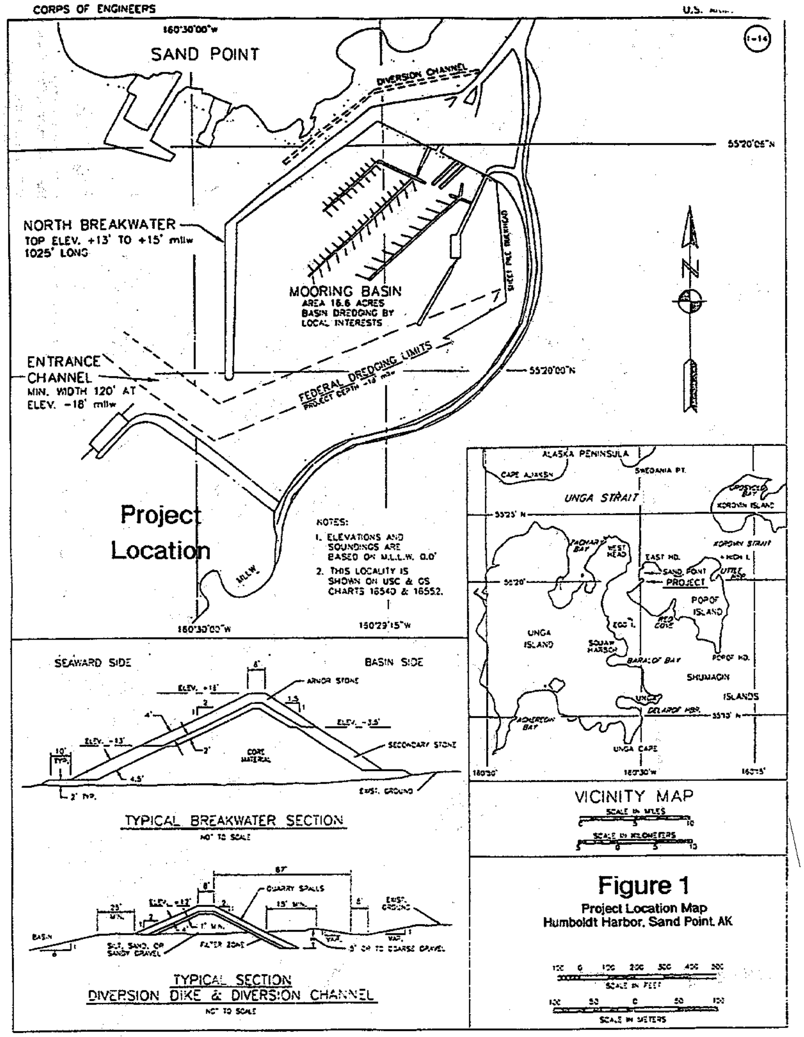


Figure 1
Project Location Map
Humboldt Harbor, Sand Point AK

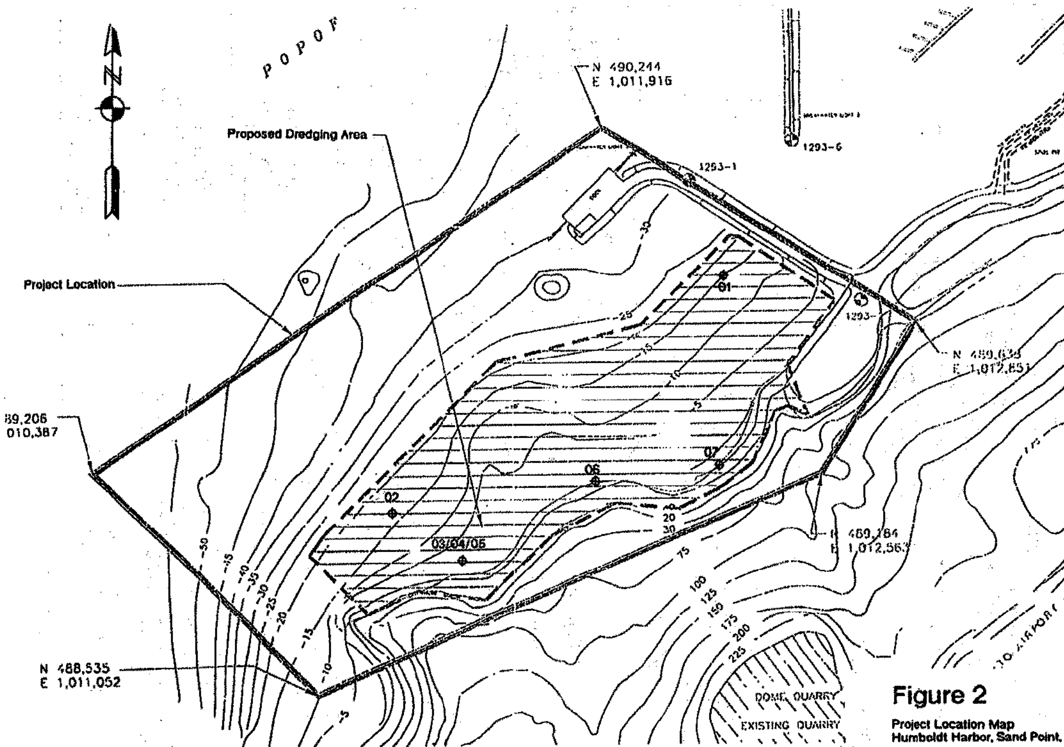


Figure 2

Project Location Map
Humboldt Harbor, Sand Point, AK

⊕ = sample location
1" = Approximately 300'

APPENDIX E

COST ESTIMATE

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE FEASIBILITY STUDY, DATED: DEC 97

PROJECT: SMALL BOAT HARBOR
LOCATION: SAND POINT, AK

DISTRICT: ALASKA
P.O.C.: FRANK J. ANTOLIN, CHIEF, CE

ACCOUNT NUMBER	FEATURE DESCRIPTION	CURRENT MCACES ESTIMATE PREPARED: DEC 05, 1997 EFFECTIVE PRICING LEVEL: OCTOBER 1, 1998 COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	AUTHORIZ./BUDGET YEAR: OCT 99 EFFECT. PRICING LEVEL: 1 OCT 98 COST ($K)	CNTG ($K)	TOTAL ($K)	........FULLY FUNDED ESTIMATE........ ($K)		COST ($K)	CNTG ($K)	FULL ($K)
C-10-01	MOB AND DEMOB	531	53	10%	584	531	53	584	AUG 99	8.8%	578	58	636
C-10.03	BREAKWATER AND SEAWALLS	3,960	792	20%	4,752	3,960	792	4,752	AUG 99	8.8%	4,308	882	5,170
C-12.010	NAVIGATION PORTS & HARBOR	1,363	273	20%	1,636	1,363	272	1,635	AUG 99	8.8%	1,483	296	1,779
C-12.030	NAV. PORTS & INNER HARBOR	1,887	189	10%	2,076	1,887	189	2,076	AUG 99	8.8%	2,053	205	2,258
	TOTAL CONSTRUCTION COSTS =====	7,741	1,306	17%	9,047	7,741	1,306	9,047			8,422	1,421	9,843
01---	LANDS AND DAMAGES	120			120	120		120	AUG 99	8.8%	130		130
30---	PLANNING, ENGINEERING & DESIGN	1,140	173	15%	1,313	1,140	173	1,313	AUG 99	8.8%	1,241	188	1,429
31---	CONSTRUCTION MANAGEMENT	907	67	7%	974	907	67	974	AUG 99	8.8%	987	73	1,060
	TOTAL PROJECT COSTS ==========>	9,908	1,547	16%	11,455	9,908	1,546	11,454			10,780	1,682	12,462

THIS TPCS REFLECTS A PROJECT COST CHANGE OF $

TOTAL FEDERAL COSTS ==============> 12,462

TOTAL NON-FEDERAL COSTS ===========>

THE MAXIMUM PROJECT COST IS =======> $

DISTRICT APPROVED: DISTRICT APPROVED DATE: ____

for CHIEF, COST ENGINEERING, Frank Antolin
CHIEF, REAL ESTATE, Dennis Klein
CHIEF, PLANNING, Kenneth Hitch
CHIEF, ENGINEERING, Claude Vining
CHIEF, OPERATIONS, Allen Churchill
CHIEF, CONSTRUCTION, Michael B Rogers
for CHIEF, CONTRACTING, Thomas Carter
PROJECT MANAGER, Janis Kara
(PM) Kirk Shadrick

DIVISION APPROVED:

____ CHIEF, COST ENGINEERING, Sam Song
____ DIRECTOR, REAL ESTATE
____ CHIEF, PROGRAMS MANAGEMENT
____ DIRECTOR OF PPMD

DIVISION APPROVED DATE ____

CONTRACT (A) **** TOTAL CONTRACT COST SUMMARY ****

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE FEASIBILITY STUDY, DATED: DEC 97

PROJECT: SMALL BOAT HARBOR
LOCATION: SAND POINT, AK

DISTRICT: ALASKA
P.O.C.: FRANK J. ANTOLIN, CHIEF, CE

ACCOUNT NUMBER	FEATURE DESCRIPTION	CURRENT MCACES ESTIMATE PREPARED: DEC 05, 1997 EFFECTIVE PRICING LEVEL: OCTOBER 1, 1996 COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	AUTHORIZ./BUDGET YEAR: OCT 99 EFFECT. PRICING LEVEL: 1 OCT 98 OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FULLY FUNDED ESTIMATE FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
C-10-01	MOB AND DEMOB	531	53	10%	584		531	53	584	AUG 99	8.8%	578	58	636
C-10-03	BREAKWATER AND SEAWALLS	3,960	792	20%	4,752		3,960	792	4,752	AUG 99	8.8%	4,308	862	5,170
C12.01	NAVIGATION PORTS & HARBORS	1,027	205	20%	1,232		1,027	205	1,232	AUG 99	8.8%	1,117	223	1,340
	TOTAL CONSTRUCTION COSTS =====	5,518	1,051	19%	6,569		5,518	1,050	6,568			6,003	1,143	7,146
P-01---	LAND AND DAMAGES	70			70		70		70	AUG 99	8.8%	76		76
P-30---	PLANNING, ENGINEERING & DESIGN	850	170	20%	1,020		850	170	1,020	AUG 99	8.8%	925	185	1,110
P-31--- 10.0%	CONSTRUCTION MANAGEMENT	647	65	10%	712		647	64	711	AUG 99	8.8%	704	70	774
	TOTAL COSTS ===================>	7,085	1,265	18%	8,370		7,085	1,284	8,369			7,708	1,398	9,106

THIS ESTIMATE IS BASED ON THE SCOPE CONTAINED IN THE FEASIBILITY STUDY, DATED: DEC 97

PROJECT: SMALL BOAT HARBOR
LOCATION: SAND POINT, AK

DISTRICT: ALASKA
P.O.C.: FRANK J. ANTOLIN, CHIEF, CE

		CURRENT MCACES ESTIMATE PREPARED: DEC 05, 1997 EFFECTIVE PRICING LEVEL: OCTOBER 1, 1996				AUTHORIZ./BUDGET YEAR: OCT 99 EFFECT. PRICING LEVEL: 1 OCT 98				.........FULLY FUNDED ESTIMATE.........				
ACCOUNT NUMBER	FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
C12.02	NAVIGATION PORTS & HARBORS	336	67	20%	403		336	67	403	AUG 99	8.8%	366	73	439
C12.03 04	NAVIGATION INNER HARBOR DEVEL	1,887	189	10%	2,076		1,887	189	2,076	AUG 99	8.8%	2,053	205	2,258
	TOTAL CONSTRUCTION COSTS =====	2,223	256	12%	2,479		2,223	256	2,479			2,419	278	2,697
P-01---	LAND AND DAMAGES	50			50		50		50	AUG 99	8.8%	54		54
P-30---	PLANNING, ENGINEERING & DESIGN	290	3	1%	293		290	3	293	AUG 99	8.8%	316	3	319
P-31---	CONSTRUCTION MANAGEMENT	260	3	1%	263		260	3	263	AUG 99	8.8%	283	3	286
	TOTAL COSTS ==================>	2,823	261	9%	3,084		2,823	262	3,085			3,072	284	3,356

Small Boat Harbor, Sand Pt., AK
ALTERNATE 1C18

D:\GOLD530\SBH\FEASIBIL\AL1C18

Designed By: CENPA-EN
Estimated By: ZINCO ESTIMATING

Prepared By: Melvin Zimmermann CCET

Preparation Date: 12/05/97
Effective Date of Pricing: 10/01/96
Est Construction Time: 180 Days

Sales Tax: 0.00%

Project Description:
Construct a 1,300-lineal feet of detached rubblemound breakwaters with a crest elevation of +16 ft MLLW.
Dredging the entrance channel to a depth -18 feet. The fairway and mooring basins to a depth of -17 MLLW.

Bases of Design:
Feasibility Report, dated Dec, 97
G.I Study

Construction Schedule:
Overtime; This cost est. has contractors crew working 1-12 hr shift day and a 6 day week.

Acquisition Plan:
There will be two contracts.
The first contract (A) is to construct the rubblemound breakwater, dredge the harbor to project depth and disposal of dredged material.
A second contract (B) will be awarded to construct the inner harbor facilities (floats, fingers and etc.)

Subcontracting Plan; Performing hydrgraphic surveys

Project Construction:
Site Access; The site can be accessed either by land construction or marine floating equipment.

Borrow Areas; There are local borrow areas in the Sand Point road network, it is not known if the rock would meet corps specs.
The COE does not designate borrow sites for rock sources.

Construction Methodology;
Assume the prime contractor will mobilize from the Seattle area, prepare his equipment and camp for work. It is assumed the breakwater rock material will come from the local Sand Point, Ak area.
This cost estimate assumes the breakwater will be constructed with land based equipment.
The harbor dredging material varies from sand, gravel, some boulders to hard dredging and drilling/shooting to breakup rock.
The harbor will be dredged with a floating crane and bucket.
The disposal materials will be loaded onto flat top barges and off loaded into trucks for upland disposal.

Perform final cleanup, prepare equipment and camp for demob and demob.

Unusual Conditions (Soil, water, weather):
Soil: Geotechical Field Exploration report indicates that some areas in the entrance channel and Fairway are of hard rock and will require drilling and shooting or some other mechanical means to loosen rock before dredging can begin.

Water: The tidal range at Sand Point N/A

Weather: Climate is maritime, with approximately 60 inches of precipitation per year. Temperatures are cool, with little variation, and seldom dip below freezing. Squalls and fog are frequent. Strong winds up to 75 Knots are common.

Unique Techniques of Construction: None

Equipment/labor Availability & Distance Traveled:
The type of equipment required for this project and the skilled labors are not available in the local project area and must be imported from elsewere. Semi-skilled laborers are available locally.

Environmental Concerns: N/A

Contingencies by Feature or Sub Feature:
P-01 Lands and Damages, N/A

C-10 Breakwater, 20% contingency, Eng & Design and are not complete at this time. Rock quantities and breakwater length is still under study.

C-12 Navigational ports & Harbors, 20% contingency, Harbor area and depth and dredging quantities may change.

P-30 Planning Engineering and Design, 20% contingency, addition Engineering will be required.

P-31 Construction Management, 10% contingency, some contract modifications could occur.

Effective Dates for labor, Equipment, Material Pricing:
Labor, 1997 MCACES Anchorage, Davis Bacon adjusted rate 1997. General Decision Number AKXXXXXX
Equipment, EP 1110-1-8 Volume, August 1995.
Material, Bid abstract, Sand Point, Ak, 1993.

```
Construction Schedule:
Mob                  |--| 5 days
Breakwater
Core Material      |----------------| 34 days
"B" Rock                     |------| 11 days
"A" Armor                         |----------| 25 days

Clean-up                                   |-| 2 days

Dredging:                       |----------/ /----------| 83 days

Weather days                                     |    | 10 days
Demob                                                 |--| 4 days
Calender days       0          15        30   37    46  50        160
```

---

* * * END TABLE OF CONTENTS * * *

U.S. Army Corps of Engineers
PROJECT AL1C18: Small Boat Harbor, Sand Pt., AK - ALTERNATE 1C18
CURRENT WORKING ESTIMATE
** PROJECT INDIRECT SUMMARY - Contract **

	QUANTY UOM	DIRECT	FIELD OH	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT
C-10 Breakwaters and Seawalls		3,488,011	385,513	240,158	337,322	40,556	4,491,560	
C-12 Navigation Ports & Harbors		2,945,258	116,951	72,855	102,331	12,303	3,249,698	
TOTAL Small Boat Harbor, Sand Pt., AK		6,433,268	502,464	313,014	439,653	52,859	7,741,258	

U.S. Army Corps of Engineers
PROJECT AL1C18: Small Boat Harbor, Sand Pt., AK - ALTERNATE 1C18
CURRENT WORKING ESTIMATE
** PROJECT INDIRECT SUMMARY - Feature **

	QUANTY UOM	DIRECT	FIELD OH	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT
C-10 Breakwaters and Seawalls								
C-10_ 01 Mob, Demob & Preparatory Work		412,660	45,609	28,413	39,908	4,798	531,388	
C-10_ 03 Breakwater		3,075,351	339,904	211,746	297,414	35,758	3,960,172	
TOTAL Breakwaters and Seawalls		3,488,011	385,513	240,158	337,322	40,556	4,491,560	
C-12 Navigation Ports & Harbors								
C-12_ 01 Ent. & Fairway Channels	47800 BCY	797,547	88,149	54,913	77,110	9,273	1,027,012	21.49
C-12_ 02 Mooring Basin Dredging	31000 BCY	260,591	28,802	17,942	25,201	3,030	335,566	10.82
C-12_ 03 Harbors, (Inner Harbor Develop.)		1,664,870	0	0	0	0	1,664,870	
C-12_ 04 Harbors, (Power, Light & Water)		222,250	0	0	0	0	222,250	
TOTAL Navigation Ports & Harbors		2,945,258	116,951	72,855	102,331	12,303	3,249,698	
TOTAL Small Boat Harbor, Sand Pt., AK		6,433,268	502,464	313,014	439,653	52,859	7,741,258	

	QUANTY UOM	DIRECT	FIELD OH	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT
C-10 Breakwaters and Seawalls								
C-10_ 01 Mob, Demob & Preparatory Work		412,660	45,609	28,413	39,908	4,798	531,388	
TOTAL Mob, Demob & Preparatory Work		412,660	45,609	28,413	39,908	4,798	531,388	
C-10_ 03 Breakwater								
C-10_ 03.01 Core Material	74100 BCY	1,310,324	144,824	90,219	126,720	15,235	1,687,322	22.77
C-10_ 03.02 Secondary Rock	21300 BCY	520,936	57,577	35,868	50,379	6,057	670,817	31.49
C-10_ 03.03 Armor Rock	29100 BCY	1,134,541	125,395	78,116	109,720	13,192	1,460,964	50.20
C-10_ 03.04 Entrance Protection		71,550	7,908	4,926	6,919	832	92,136	
C-10_ 03.05 Navigation Foundation	2.00 EA	8,000	884	551	774	93	10,302	5150.86
C-10_ 03.06 Hydrographic Survey	2.00 EA	30,000	3,316	2,066	2,901	349	38,631	19316
TOTAL Breakwater		3,075,351	339,904	211,746	297,414	35,758	3,960,172	
TOTAL Breakwaters and Seawalls		3,488,011	385,513	240,158	337,322	40,556	4,491,560	
C-12 Navigation Ports & Harbors								
C-12_ 01 Ent. & Fairway Channels								
C-12_ 01.01 Entrance Channel	44300 BCY	747,465	82,614	51,465	72,287	8,691	962,521	21.73
C-12_ 01.02 Fairway	3500.00 BCY	35,082	3,877	2,415	3,393	408	45,176	12.91
C-12_ 01.99 Hydrographic Survey	1.00 EA	15,000	1,658	1,033	1,451	174	19,316	19316
TOTAL Ent. & Fairway Channels	47800 BCY	797,547	88,149	54,913	77,130	9,273	1,027,012	21.49
C-12_ 02 Mooring Basin Dredging								
C-12_ 02.01 Mooring Dredging	31000 BCY	260,591	28,802	17,942	25,201	3,030	335,566	10.82
TOTAL Mooring Basin Dredging	31000 BCY	260,591	28,802	17,942	25,201	3,030	335,566	10.82
C-12_ 03 Harbors, (Inner Harbor Develop.)		1,664,870	0	0	0	0	1,664,870	
C-12_ 04 Harbors, (Power, Light & Water)		222,250	0	0	0	0	222,250	
TOTAL Navigation Ports & Harbors		2,945,258	116,951	72,855	102,331	12,303	3,249,698	
TOTAL Small Boat Harbor, Sand Pt., AK		6,433,268	502,464	313,014	439,653	52,859	7,741,258	

	QUANTY UOM	DIRECT	FIELD OH	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT
C-10 Breakwaters and Seawalls								
C-10_ 01 Mob, Demob & Preparatory Work		412,660	45,609	28,413	39,908	4,798	531,388	
TOTAL Mob, Demob & Preparatory Work		412,660	45,609	28,413	39,908	4,798	531,388	
C-10_ 03 Breakwater								
C-10_ 03.01 Core Material								
C-10_ 03.01.02 Core Material Placement	81100 LCY	1,310,324	144,824	90,219	126,720	15,235	1,687,322	20.81
TOTAL Core Material	74100 BCY	1,310,324	144,824	90,219	126,720	15,235	1,687,322	22.77
C-10_ 03.02 Secondary Rock								
C-10_ 03.02.02 Secondary Rock Placement	23300 LCY	520,936	57,577	35,868	50,379	6,057	670,817	28.79
TOTAL Secondary Rock	21300 BCY	520,936	57,577	35,868	50,379	6,057	670,817	31.49
C-10_ 03.03 Armor Rock								
C-10_ 03.03.04 Armor Rock Placement	32100 LCY	1,134,541	125,395	78,116	109,720	13,192	1,460,964	45.51
TOTAL Armor Rock	29100 BCY	1,134,541	125,395	78,116	109,720	13,192	1,460,964	50.20
C-10_ 03.04 Entrance Protection								
C-10_ 03.04.03 Filter Stone	1400.00 BCY	22,588	2,497	1,555	2,184	263	29,087	20.78
C-10_ 03.04.04 "A" Stone	2700.00 BCY	48,961	5,411	3,371	4,735	569	63,048	23.35
TOTAL Entrance Protection		71,550	7,908	4,926	6,919	832	92,136	
C-10_ 03.05 Navigation Foundation	2.00 EA	8,000	884	551	774	93	10,302	$150.86
C-10_ 03.06 Hydrographic Survey	2.00 EA	30,000	3,316	2,066	2,901	349	38,631	19316
TOTAL Breakwater		3,075,351	339,904	211,746	297,414	35,758	3,960,172	
TOTAL Breakwaters and Seawalls		3,488,011	385,513	240,158	337,322	40,556	4,491,560	
C-12 Navigation Ports & Harbors								
C-12_ 01 Ent. & Fairway Channels								
C-12_ 01.01 Entrance Channel								

U.S. Army Corps of Engineers
PROJECT AL1C18: Small Boat Harbor, Sand Pt., AK - ALTERNATE 1C18
CURRENT WORKING ESTIMATE
** PROJECT INDIRECT SUMMARY - Element **

	QUANTY UOM	DIRECT	FIELD OH	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT
C-12_ 01.01.03 Sand & Gravel Dredging	27450 BCY	221,289	24,458	15,236	21,401	2,573	284,956	10.38
C-12_ 01.01.04 Hard Mech Dredging	11450 BCY	112,528	12,437	7,748	10,882	1,308	144,904	12.66
C-12_ 01.01.05 Drilling/Blasting & Dredging	5400.00 BCY	413,648	45,719	28,481	40,004	4,810	532,661	98.64
TOTAL Entrance Channel	44300 BCY	747,465	82,614	51,465	72,287	8,691	962,521	21.73
C-12_ 01.02 Fairway								
C-12_ 01.02.01 Mech Dredging	5000.00 LCY	13,995	1,547	964	1,353	163	18,022	3.60
C-12_ 01.02.02 Upland Disposal	5000.00 LCY	21,087	2,331	1,452	2,039	245	27,154	5.43
TOTAL Fairway	3500.00 BCY	35,082	3,877	2,415	3,393	408	45,176	12.91
C-12_ 01.99 Hydrographic Survey	1.00 EA	15,000	1,658	1,033	1,451	174	19,316	19316
TOTAL Ent. & Fairway Channels	47800 BCY	797,547	88,149	54,913	77,130	9,273	1,027,012	21.49
C-12_ 02 Mooring Basin Dredging								
C-12_ 02.01 Mooring Dredging								
C-12_ 02.01.01 Mech Dredging	39000 LCY	109,165	12,065	7,516	10,557	1,269	140,573	3.60
C-12_ 02.01.02 Upland Disposal	39000 LCY	151,426	16,736	10,426	14,644	1,761	194,993	5.00
TOTAL Mooring Dredging	31000 BCY	260,591	28,802	17,942	25,201	3,030	335,566	10.82
TOTAL Mooring Basin Dredging	31000 BCY	260,591	28,802	17,942	25,201	3,030	335,566	10.82
C-12_ 03 Harbors, (Inner Harbor Develop.)		1,664,870	0	0	0	0	1,664,870	
C-12_ 04 Harbors, (Power, Light & Water)		222,250	0	0	0	0	222,250	
TOTAL Navigation Ports & Harbors		2,945,258	116,951	72,855	102,331	12,303	3,249,698	
TOTAL Small Boat Harbor, Sand Pt., AK		6,433,268	502,464	313,014	439,653	52,859	7,741,258	

	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIA	TOTAL COST	UNIT
C-10 Breakwaters and Seawalls			8,579	463459	1,036,651	1987900	3,488,011	
C-12 Navigation Ports & Harbors			7,659	401610	617,852	1925795	2,945,258	
TOTAL Small Boat Harbor, Sand Pt., AK			16,237	865069	1,654,504	3913695	6,433,268	
Prime Contractor's Field Overhead							502,464	
SUBTOTAL							6,935,732	
Prime's Home Office Expense							313,014	
SUBTOTAL							7,248,746	
Prime Contractor's Profit							439,653	
SUBTOTAL							7,688,399	
Prime Contractor's Bond							52,859	
TOTAL INCL INDIRECTS							7,741,258	

U.S. Army Corps of Engineers
PROJECT AL1C18: Small Boat Harbor, Sand Pt., AK - ALTERNATE 1C18
CURRENT WORKING ESTIMATE
** PROJECT DIRECT SUMMARY - Feature **

	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIA	TOTAL COST	UNIT
C-10 Breakwaters and Seawalls								
C-10_ 01 Mob, Demob & Preparatory Work			0	27,620	373,040	12,000	412,660	
C-10_ 03 Breakwater			8,579	435839	663,611	1975900	3,075,351	
TOTAL Breakwaters and Seawalls			8,579	463459	1,036,651	1987900	3,488,011	
C-12 Navigation Ports & Harbors								
C-12_ 01 Ent. & Fairway Channels	47800	BCY	5,653	295305	325,567	176,675	797,547	16.69
C-12_ 02 Mooring Basin Dredging	31000	BCY	2,006	106305	154,286	0	260,591	8.41
C-12_ 03 Harbors, (Inner Harbor Develop.)			0	0	138,000	1526870	1,664,870	
C-12_ 04 Harbors, (Power, Light & Water)			0	0	0	222,250	222,250	
TOTAL Navigation Ports & Harbors			7,659	401610	617,852	1925795	2,945,258	
TOTAL Small Boat Harbor, Sand Pt., AK			16,237	865069	1,654,504	3913695	6,433,268	
Prime Contractor's Field Overhead							502,464	
SUBTOTAL							6,935,732	
Prime's Home Office Expense							313,014	
SUBTOTAL							7,248,746	
Prime Contractor's Profit							439,653	
SUBTOTAL							7,688,399	
Prime Contractor's Bond							52,859	
TOTAL INCL INDIRECTS							7,741,258	

	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIA	TOTAL COST	UNIT
C-10 Breakwaters and Seawalls								
C-10_ 01 Mob, Demob & Preparatory Work			0	27,620	373,040	12,000	412,660	
TOTAL Mob, Demob & Preparatory Work			0	27,620	373,040	12,000	412,660	
C-10_ 03 Breakwater								
C-10_ 03.01 Core Material	74100	BCY	4,055	204702	294,622	811,000	1,310,324	17.68
C-10_ 03.02 Secondary Rock	21300	BCY	1,363	70,445	100,992	349,500	520,936	24.46
C-10_ 03.03 Armor Rock	29100	BCY	2,945	149350	214,791	770,400	1,134,541	38.99
C-10_ 03.04 Entrance Protection			216	11,343	15,207	45,000	71,550	
C-10_ 03.05 Navigation Foundation	2.00	EA	0	0	8,000	0	8,000	4000.00
C-10_ 03.06 Hydrographic Survey	2.00	EA	0	0	30,000	0	30,000	15000
TOTAL Breakwater			8,579	435839	663,611	1975900	3,075,351	
TOTAL Breakwaters and Seawalls			8,579	463459	1,036,651	1987900	3,488,011	
C-12 Navigation Ports & Harbors								
C-12_ 01 Ent. & Fairway Channels								
C-12_ 01.01 Entrance Channel	44300	BCY	5,396	280747	290,043	176,675	747,465	16.87
C-12_ 01.02 Fairway	3500.00	BCY	257	14,558	20,524	0	35,082	10.02
C-12_ 01.99 Hydrographic Survey	1.00	EA	0	0	15,000	0	15,000	15000
TOTAL Ent. & Fairway Channels	47800	BCY	5,653	295305	325,567	176,675	797,547	16.69
C-12_ 02 Mooring Basin Dredging								
C-12_ 02.01 Mooring Dredging	31000	BCY	2,006	106305	154,286	0	260,591	8.41
TOTAL Mooring Basin Dredging	31000	BCY	2,006	106305	154,286	0	260,591	8.41
C-12_ 03 Harbors, (Inner Harbor Develop.)			0	0	138,000	1526870	1,664,870	
C-12_ 04 Harbors, (Power, Light & Water)			0	0	0	222,250	222,250	
TOTAL Navigation Ports & Harbors			7,659	401610	617,852	1925795	2,945,258	
TOTAL Small Boat Harbor, Sand Pt., AK			16,237	865069	1,654,504	3913695	6,433,268	
Prime Contractor's Field Overhead							502,464	
SUBTOTAL							6,935,732	
Prime's Home Office Expense							313,014	

U.S. Army Corps of Engineers
PROJECT AL1C18: Small Boat Harbor, Sand Pt., AK - ALTERNATE 1C18
CURRENT WORKING ESTIMATE
** PROJECT DIRECT SUMMARY - Sub Feat **

	QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIA	TOTAL COST	UNIT
SUBTOTAL							7,248,746	
Prime Contractor's Profit							439,653	
SUBTOTAL							7,688,399	
Prime Contractor's Bond							52,859	
TOTAL INCL INDIRECTS							7,741,258	

U.S. Army Corps of Engineers
PROJECT AL1C18: Small Boat Harbor, Sand Pt., AK - ALTERNATE 1C18
CURRENT WORKING ESTIMATE
** PROJECT DIRECT SUMMARY - Element **

		QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIA	TOTAL COST	UNIT
C-10	Breakwaters and Seawalls								
C-10_	01 Mob, Demob & Preparatory Work			0	27,620	373,040	12,000	412,660	
	TOTAL Mob, Demob & Preparatory Work			0	27,620	373,040	12,000	412,660	
C-10_	03 Breakwater								
C-10_	03.01 Core Material								
C-10_	03.01.02 Core Material Placement	81100	LCY	4,055	204702	294,622	811,000	1,310,324	16.16
	TOTAL Core Material	74100	BCY	4,055	204702	294,622	811,000	1,310,324	17.68
C-10_	03.02 Secondary Rock								
C-10_	03.02.02 Secondary Rock Placement	23300	LCY	1,363	70,445	100,992	349,500	520,936	22.36
	TOTAL Secondary Rock	21300	BCY	1,363	70,445	100,992	349,500	520,936	24.46
C-10_	03.03 Armor Rock								
C-10_	03.03.04 Armor Rock Placement	32100	LCY	2,945	149350	214,791	770,400	1,134,541	35.34
	TOTAL Armor Rock	29100	BCY	2,945	149350	214,791	770,400	1,134,541	38.99
C-10_	03.04 Entrance Protection								
C-10_	03.04.03 Filter Stone	1400.00	BCY	51	3,169	4,419	15,000	22,588	16.13
C-10_	03.04.04 "A" Stone	2700.00	BCY	165	8,174	10,787	30,000	48,961	18.13
	TOTAL Entrance Protection			216	11,343	15,207	45,000	71,550	
C-10_	03.05 Navigation Foundation	2.00	EA	0	0	8,000	0	8,000	4000.00
C-10_	03.06 Hydrographic Survey	2.00	EA	0	0	30,000	0	30,000	15000
	TOTAL Breakwater			8,579	435839	663,611	1975900	3,075,351	
	TOTAL Breakwaters and Seawalls			8,579	463459	1,036,651	1987900	3,488,011	
C-12	Navigation Ports & Harbors								
C-12_	01 Ent. & Fairway Channels								
C-12_	01.01 Entrance Channel								

U.S. Army Corps of Engineers
PROJECT AL1C18: Small Boat Harbor, Sand Pt., AK - ALTERNATE 1C18
CURRENT WORKING ESTIMATE
** PROJECT DIRECT SUMMARY - Element **

		QUANTY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIA	TOTAL COST	UNIT
C-12_	01.01.03 Sand & Gravel Dredging	27450	BCY	1,733	89,698	131,590	0	221,289	8.06
C-12_	01.01.04 Hard Mech Dredging	11450	BCY	887	44,917	67,611	0	112,528	9.83
C-12_	01.01.05 Drilling/Blasting & Dredging	5400.00	BCY	2,776	146132	90,842	176,675	413,648	76.60
	TOTAL Entrance Channel	44300	BCY	5,396	280747	290,043	176,675	747,465	16.87
C-12_	01.02 Fairway								
C-12_	01.02.01 Mech Dredging	5000.00	LCY	114	5,064	8,931	0	13,995	2.80
C-12_	01.02.02 Upland Disposal	5000.00	LCY	143	9,494	11,593	0	21,087	4.22
	TOTAL Fairway	3500.00	BCY	257	14,558	20,524	0	35,082	10.02
C-12_	01.99 Hydrographic Survey	1.00	EA	0	0	15,000	0	15,000	15000
	TOTAL Ent. & Fairway Channels	47800	BCY	5,653	295305	325,567	176,675	797,547	16.69
C-12_	02 Mooring Basin Dredging								
C-12_	02.01 Mooring Dredging								
C-12_	02.01.01 Mech Dredging	39000	LCY	891	39,501	69,664	0	109,165	2.80
C-12_	02.01.02 Upland Disposal	39000	LCY	1,114	66,804	84,622	0	151,426	3.88
	TOTAL Mooring Dredging	31000	BCY	2,006	106305	154,286	0	260,591	8.41
	TOTAL Mooring Basin Dredging	31000	BCY	2,006	106305	154,286	0	260,591	8.41
C-12_	03 Harbors, (Inner Harbor Develop.)			0	0	138,000	1526870	1,664,870	
C-12_	04 Harbors, (Power, Light & Water)			0	0	0	222,250	222,250	
	TOTAL Navigation Ports & Harbors			7,659	401610	617,852	1925795	2,945,258	
	TOTAL Small Boat Harbor, Sand Pt., AK			16,237	865069	1,654,504	3913695	6,433,268	
	Prime Contractor's Field Overhead							502,464	
	SUBTOTAL							6,935,732	
	Prime's Home Office Expense							313,014	
	SUBTOTAL							7,248,746	
	Prime Contractor's Profit							439,653	
	SUBTOTAL							7,688,399	
	Prime Contractor's Bond							52,859	
	TOTAL INCL INDIRECTS							7,741,258	

APPENDIX F

REAL ESTATE REQUIREMENTS

ASSESSMENT OF NON-FEDERAL SPONSOR'S REAL ESTATE ACQUISITION CAPABILITY

PROJECT NAME: SAND POINT SMALL BOAT HARBOR
SPONSOR: ALEUTIANS EAST BOROUGH

I. Legal Authority:

a. Does the sponsor have legal authority to acquire and hold title to real property for project purposes? **YES**

b. Does the sponsor have the power of eminent domain for this project? **YES**

c. Does the sponsor have "quick-take" authority for this project? **YES**

d. Are any of the lands/interests in land required for the project located outside the sponsor's political boundary? **NO**

e. Are any of the lands/interests in land required for the project owned by an entity whose property the sponsor cannot condemn? **YES, State Tidelands**

II. Human Resource Requirements:

a. Will the sponsor's in-house staff require training to become familiar with the real estate requirements of Federal projects including P.L. 91-646, as amended? **NO**

b. If the answer to II.a. is yes, has a reasonable plan been developed to provide such training? **N/A**

c. Does the sponsor's in-house staff have sufficient real estate acquisition experience to meet its responsibilities for the project? **YES**

d. Is the sponsor's projected in-house staffing level sufficient considering its other work load, if any, and the project schedule? **YES**

e. Can the sponsor obtain contractor support, if required, in a timely fashion? **YES**

f. Will the sponsor likely request USACE assistance in acquiring real estate? **NO**

III. Other Project Variables:

a. Will the sponsor's staff be located within reasonable proximity to the project site? **YES**

b. Has the sponsor approved the project/real estate schedule/milestones? **NO. Not yet established.**

IV. Overall Assessment:

a. Has the sponsor performed satisfactorily on other USACE projects? **N/A - No other projects have been sponsored by the Aleutians East Borough.**

b. With regard to this project, the sponsor is anticipated to be: highly capable/**fully capable**/moderately capable/ marginally capable/insufficiently capable.

V. Coordination:

a. Has this assessment been coordinated with the sponsor? **YES**

b. Does the sponsor concur with this assessment? **YES**

SOURCE:
Bob Jetner
Borough Administrator
Aleutians East Borough
907/274-7555

Prepared By:

Harold D. Hopson

Name: Harold D. Hopson
Title: Chief, Planning & Control Br.
Date:

Reviewed and approved by:

Dennis E. Klein

Dennis E. Klein
Chief, Real Estate Division

APPENDIX G

CORRESPONDENCE

The **Aleut Corporation**

September 6, 1995

Robert S. Juettner
Borough Administrator
Aleutians East Borough
1600 A Street, Suite 103
Anchorage, Alaska 99501

Re: Dome Quarry, Sand Point, Alaska

Dear Bob:

This is to let you know that the Dome Quarry which is owned by The Aleut Corporation, a native regional corporation formed under the Alaska Native Claims Settlement Act, is available for any future projects the Borough may be contemplating. As you are aware, rock from the Dome Quarry has met contract specifications for the recent airport job and the boat harbor project in the past..

I have attached the Aleut Corporation royalty rate schedule for your information. Please let me know if you have any questions.

Sincerely,

Robert J. Stanton, Jr.
Vice President
Lands & Real Estate

ALEUTIANS EAST BOROUGH

SERVING THE COMMUNITIES OF
■ KING COVE ■ SAND POINT ■ AKUTAN ■ COLD BAY ■ FALSE PASS ■ NELSON LAGOON

March 18, 1996

Colonel Peter A. Topp
District Engineer
Attn: Project Formulation Section
U.S. Army Engineer District, Alaska
P.O. Box 898
Anchorage, AK 99506-0898

Dear Colonel Topp:

The Aleutians East Borough, Alaska, intends to cooperate with the Federal Government in initiating a feasibility study for the Sand Point Boat Harbor Improvement project.

We understand this is a cost-shared study and our share is 50 per cent (50%) of the total feasibility study cost. We also understand our share may be split as follows:

a. In-kind services, as described in the Project Study Plan. The maximum credit allowable for in-kind services will be 25 per cent (25%) of the total feasibility study cost.

b. Cash for the remaining sponsor's share.

We have reviewed a proposed draft Feasibility Cost-Sharing Agreement, including its attached Project Study Plan. We understand and agree with the scope and cost for the feasibility study as detailed in the study plan. We intend to enter into such an agreement when the study plan is approved by the Corps' North Pacific Division office.

The AEB and the City of Sand Point believe this project will culminate in construction of improvements for the Sand Point boat harbor. This belief is based upon the good working relationship developed between us and the District's staff. Furthermore, we have every confidence that the feasibility study will validate our sponsorship and continued support of this project.

We understand that if this letter of intent is acceptable, you will request funds for the Federal share of the feasibility study. We understand this letter is a statement of intent, not a binding contract.

Sincerely,

Robert S. Juettner
Borough Administrator

City of Sand Point

March 19, 1996

Ms. Janis Kara
Civil Works Branch
U.S. Army Engineer District, Alaska
P.O. Box 898
Anchorage, Alaska 99506-0898

Re: Sand Point Boat Harbor

Dear Ms. Kara,

Having been a lifelong resident of Sand Point and a commercial fisherman for the past 30 years as well as Mayor of the City for nearly 6 years, I do have a intimate knowledge of the harbor and needs of the fleet.

With the recent airport expansion, Sand Point's accessibility has been greatly increased through the use of larger aircraft. In previous times, people were skeptical about flying in smaller aircraft due to the ever changing climatic conditions which made even seasoned travelers ill.

Presently, the existing harbor can only accommodate a limited number of 60 foot plus boats which is 17 to be exact. With the various fishing season openings, these boats are forced to make 3 trips back to the Pacific Northwest for the lack of accommodations. The enlargement of the Sand Point Harbor would eliminate at least one trip per year to Seattle and potentially be a home port instead of Seattle.

Should you have any questions, please feel free to contact me.

Sincerely,

Alvin D. Osterback
Mayor

City of Sand Point

RESOLUTION 97-36
A RESOLUTION OF THE CITY OF SAND POINT ENDORSING PLAN 1-C AS THE DESIRED HARBOR EXPANSION PLAN

WHEREAS: the City of Sand Point desires to expand it's harbor to accommodate the larger fishing vessels, and

WHEREAS: Sand Point is the largest home port for the fishing fleet between Unalaska and Kodiak, and

WHEREAS: the present harbor does not have the room nor the ability to accommodate boats in excess of 100 feet, and

WHEREAS: the homeporting of the fishing fleet in Sand Point increases local commerce and encourages local economic diversification, and

WHEREAS: the City Council has reviewed the three proposed harbor expansion plans as prepared by DOT/PF and the Corps of Engineers.

NOW THEREFORE BE IT RESOLVED THAT the City of Sand Point endorses Plan 1-C as the desired harbor expansion plan and configuration.

PASSED AND ADOPTED BY A DULY CONSTITUTED QUORUM OF THE CITY COUNCIL FOR THE CITY OF SAND POINT THIS 8th day of October, 1997.

Mayor

ATTEST

City Clerk

City of Sand Point

October 29, 1997

Mr. Guy R. McConnell
Chief, Environmental Resources Section
Department of the Army
U.S. Army Engineer District, Alaska
P.O. Box 898
Anchorage, Alaska 99508-0898

Re: Sand Point Harbor Expansion

Dear Mr. McConnell,

At a Special Meeting of the Sand Pont City Council held on October 8, 1997, Resolution 97-36, a Resolution of the City of Sand Point Endorsing Plan 1-C as the Desired Harbor Expansion Plan was passed and adopted by a duly constituted quorum of the Sand Point City Council.

Should you have any questions please feel free to contact the City offices Monday – Friday 8:00 a.m. to 4:00 p.m..

Sincerely,

Barbara J. Wilson

Barbara J. Wilson
City Clerk

Enclosure (1)

cc: Mayor Gundersen
City Administrator

ALEUTIANS EAST BOROUGH

SERVING THE COMMUNITIES OF
■ KING COVE ■ SAND POINT ■ AKUTAN ■ COLD BAY ■ FALSE PASS ■ NELSON LAGOON

January 13, 1998

Colonel Sheldon L. Jahn
Commander & District Engineer
U.S. Army Corps of Engineers
Alaska District
P.O. Box 898
Anchorage, AK 99506-0898

Dear Col. Jahn,

The Alaska District is ready to forward the *Navigation Improvements Detailed Project Report for Sand Point, Alaska* on to the Pacific Ocean Division for review. The Recommended Plan, with a benefit/cost ratio of 2.0:1, calls for the construction of a new mooring basin of approximately 8.6 acres, dredged to a depth of -17' which will provide protective moorage for 37 vessels ranging in size from 80 to 150 feet. The fully funded cost is estimated to be $12,462,000 with a local sponsor's financial obligation of $4,274,000.

The Aleutians East Borough, as the local sponsor, will be responsible for the provision of matching funds. On October 7, 1997, the residents of the Aleutians East Borough approved $6.4M in GO Bonds for the construction of the boat harbors. The money was intended to be used as matching funds to the Corps of Engineers navigation improvements program. Of the $6.4M, $1.1M was reserved for the Sand Point project. The Alaska Department of Transportation & Public Facilities has $100,000 currently for the Sand Point project. The Aleutians East Borough will work with the Alaska Department of Transportation & Public Facilities and the Governor to increase that amount of funding to $1.1M. For years, the Borough has advocated a partnership with the State of Alaska whereby we split the local contribution on a dollar for dollar basis. The concept is generally well received.

The additional $2.1M will be made up through the use of revenue bonds, general fund appropriations from the Aleutians East Borough and grants where possible. (The Borough has developed a good working relationship with the Economic Development Administration over the years and received two grants totaling $1.0M for marine related infrastructure. EDA funds would be used to complete the float system.)

One of the unique characteristics of the Aleutians East Borough's finances is the Permanent Fund. Each year, 15% of the Borough's main revenue stream is transferred to this fund which is currently in excess of $15M. When the fund hits $20M, sometime in 2000 or early 2001, it will be capped and the money used for the deposit is available for appropriation. Also, approximately 50% of the annual earning of the Permanent Fund will be available for appropriation. This would make $1.1M per year available for appropriation.

The Borough is confident that sufficient funding will be available to meet the local sponsor's matching requirements. If you have any questions, please contact me at the address listed below.

Sincerely,

Robert S. Juettner
Administrator

ALEUTIANS EAST BOROUGH

SERVING THE COMMUNITIES OF
■ KING COVE ■ SAND POINT ■ AKUTAN ■ COLD BAY ■ FALSE PASS ■ NELSON LAGOON

January 13, 199~~7~~8

Colonel Sheldon L. Jahn
Commander & District Engineer
U.S. Army Corps of Engineers
Alaska District
P.O. Box 898
Anchorage, AK 99506-0898

Dear Col. Jahn:

This letter expresses the intent of the Aleutians East Borough, Alaska, to cooperate with the Federal Government in initiating construction of the navigation improvements for Sand Point, Alaska. We understand that the Aleutians East Borough would be required to pay the non-Federal share of the costs of construction of general navigation features as specified by Section 101 of the Water Resources Development Act of 1986 (Public Law 99-662). We further understand that the non-Federal share of these features, based on the above law and the Harbor Improvement Feasibility Report and Environmental Assessment, is currently estimated to be $4,274,000.

We also understand that the Aleutians East Borough would be required to do the following:

a. Contribute in cash the local share of project planning and construction cost;

b. Provide, without cost to the United States, all lands, easements, and rights-of-way necessary for the construction, operation, and maintenance of the project, including suitable quarry sites and disposal areas for dredged materials, with any necessary retaining dikes, bulkheads, and embankments or the cost thereof;

c. Accomplish in a timely manner, without cost to the United States, all alterations and relocations of buildings, streets, utilities, storm drains, pipelines, power lines, and other structures and improvements required for construction, operation, or maintenance of the project;

d. Hold and save the United States free from damages due to the construction and maintenance of the project, except damages due to the fault or negligence of the United States or its contractors;

e. Assume responsibility for construction and installation of all non-Federal project features, including the dredged basin and appurtenant facilities and services, and for operation and maintenance of the basin and facilities;

f. Maintain and operate all the non-Federal works after completion in accordance with regulations prescribed by the Secretary of the Army;

g. Provide and maintain berthing areas, floats, piers, slips, and similar marina and mooring facilities as needed for transient and local vessels, as well as needed public use shore facilities open and available to all on equal terms;

h. Assume financial responsibility for the cleanup of hazardous materials located on project lands and covered under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) without cost-sharing credit; and

i. Be responsible for operating, maintaining, repairing, replacing and rehabilitating the project in a manner so that liability will not arise under CERCLA.

I believe the Aleutians East Borough has the ability to obtain the non-Federal portion of the project funds. It currently has $1.1 million in G.O. bond authority. Additional funding will be available through a combination of funds, including, but not limited to, revenue bond, Borough general fund appropriation and financial support from the State of Alaska.

It is further understood that if this letter of intent is acceptable, you as District Engineer will recommend that funds for the Federal share of the harbor be procured. We understand that this letter is a statement of intent, not a binding contract.

Sincerely,

Robert S. Juettner
Borough Administrator

APPENDIX H

SPONSOR'S FINANCING PLAN AND CORPS' ASSESSMENT

SAND POINT, ALASKA
ASSESSMENT OF SPONSOR'S FINANCING CAPABILITY

The Sand Point Harbor project is proposed for authorization in fiscal year 2000. The Aleutians East Borough will be the non-federal sponsor for this project.

The cost estimate indicates that the fully funded cost for the project will be $12,462,000, including non-federal costs of $3,302,000 for inner harbor facilities. The Federal Government will provide 80 percent of the cost of the general navigation features, estimated at $7,229,000; the local sponsor will provide the remaining 20 percent, estimated at $1,931,000. The Aleutians East Borough has developed a statement of financial capability which utilizes State of Alaska appropriated funds and funds generated by the borough.

The Aleutians East Borough has developed a financial plan that utilizes State of Alaska appropriations. The Alaska Department of Transportation and Public Facilities (ADOT) has authorized the immediate expenditure of $100,000 for preliminary engineering and design (PED). The department also supports the community's effort in securing any additional State funds needed to complete the project. A letter of support from ADOT is attached to this financing plan.

The financial capability statement submitted by the Aleutians East Borough, along with the letter from ADOT, appear to provide adequate proof of funding availability for the project. The tables in this statement outline local financial obligations associated with the project and expected revenue sources to fund these expenditures. The local sponsor appears to have the capability to finance its portion of the project costs.

FOR [signature] LTC, EN

Sheldon L. Jahn
Colonel, Corps of Engineers
District Engineer

STATEMENT OF FINANCIAL CAPABILITY

March, 1998

ALEUTIANS EAST BOROUGH

SERVING THE COMMUNITIES OF
■ KING COVE ■ SAND POINT ■ AKUTAN ■ COLD BAY ■ FALSE PASS ■ NELSON LAGOON

March 19, 1998

Col. Sheldon L. Jahn
Commander & District Engineer
U.S. Army Corps of Engineers
Alaska District
P.O. Box 898
Anchorage, AK 99506-0898

Dear Col. Jahn:

Attached is our Statement of Financial Capability for the proposed Sand Point Boat Harbor Project.

The Aleutians East Borough fully supports the creation of additional moorage in Sand Point. The Borough is willing and capable of executing the Project Cooperation Agreement based upon the attached Statement of Financial Capability. The Borough believes it has sufficient non-federal funds to contribute to this project when needed. Additional funding will be sought from the State of Alaska on a dollar for dollar match. We anticipate using the State's contribution and revenue bonding to complete the inner harbor improvements.

We are continuing to work diligently on the Sand Point Boat Harbor project and are looking forward to hearing from you in the near future. Should it be necessary to make any changes in the Statement of Financial Capability, please contact me at the Anchorage office listed below.

Sincerely,

Robert S. Juettner
Administrator

Enclosures as indicated

The Aleutians East Borough (AEB) and the Army Corps of Engineers (COE) are in the process of finalizing the feasibility study on the Sand Point boat harbor project. PED is scheduled to begin in April and the COE is striving to meet the timeline for the Water Resource Development Act of 1998. An integral part of the process is a statement from the AEB on how it proposes to meet its financial commitments as non federal local sponsor which is estimated to be $4,274,000. (fully funded $5,233,000)

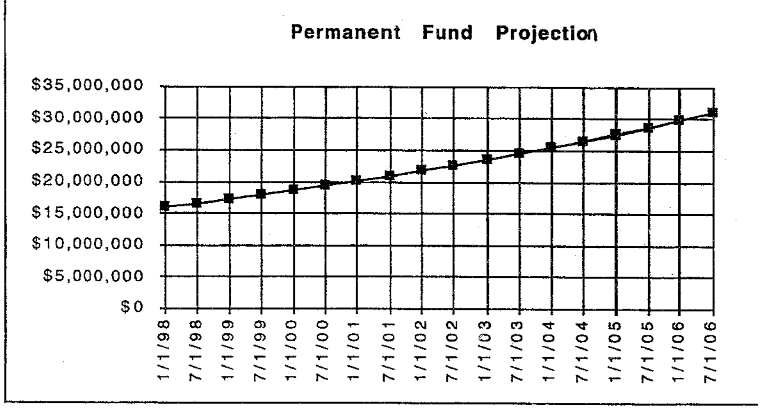
The AEB has two unique financial characteristics which will allow it to fulfill the local sponsor's commitment for this project. First, it has an established record of GO Bonding along with a current GO Bond authority for this project and private sector borrowing to finance its projects. Second, it has a large reserve account, the Permanent Fund, which in a few years will generate a significant portion of the AEB's general fund revenue stream.

The AEB started to issue GO Bonds through the Alaska Municipal Bond Bank Authority (Bond Bank) in 1990 with its 1990B issue of $1,025,000. Additional GO Bonds were issued in 1991, 1992 and 1993 with a total original par value of $7,525,000. As of December 31, 1997, the outstanding value of the GO Bonds was $3,455,000. Starting in 1999, the original GO Bond will be retired with additional bonds being repaid each year through 2002.

On October 7, 1997, the residents of the AEB overwhelmingly passed a $9.5M GO Bond proposition. The bond proposition was presented to the voters in anticipation of the retirement of the GO Bonds issued between 1990 and 1993 and in anticipation of a number of new boat harbor projects. On April 9, 1998, the AEB will issue its 1998A GO Bond in the amount of $2,350,000 for the King Cove Boat Harbor Project and expects to issue $1,050,000 in GO Bond for the Sand Point Boat Harbor in 2000.

In addition to the issuance of GO Bonds, the AEB has borrowed from a commercial lender twice in the recent past. In 1994 and 1996, lease purchase agreements were issued in the aggregate amount of $2,550,000 for a term of ten years. These will be paid off in 2004 and 2006. Assuming that a revenue bond will be necessary to finance the inner harbor development of the float system and utilities, the AEB will be in a position to utilize private sector or Bond Bank financing. A pro forma statement is attached which demonstrates that the completed Sand Point Boat Harbor can support a revenue bond to complete the inner harbor development and the associated operating, maintenance and replacement costs which are estimated to be $22,000 per year for the non federal local sponsor.

What makes the AEB attractive to the Bond Bank and other financial institutions is its Permanent Fund. Several years ago, the Assembly adopted a policy of making regular deposits to this account. 15% of its gross revenue stream must be deposited to the Permanent Fund until it reaches $20,000,000. The Permanent Fund should hit its target between July 1, 2000 and July 1, 2001.



When this occurs, the Permanent Fund is capped and the 15% revenue stream, approximately $450,000 this fiscal year, is available for appropriation. More importantly, the excess earnings of the Permanent Fund, those earnings in excess of the inflation rate, are available for appropriation. Assuming a rate or return of 7% when the Permanent Fund is capped and a 3% inflation rate, the Permanent Fund will generate a minimum of $900,000 per year to be appropriated by the Assembly. The following table illustrates this point.

	Starting Bal.	Interest/Dividend	Less Surplus	Total
1/1/01	$20,100,254	$1,407,018	$924,608	$20,582,664
1/1/02	$20,582,664	$1,440,786	$946,798	$21,076,652
1-Jan	$21,076,652	$1,475,366	$969,522	$21,582,496
1/1/04	$21,582,496	$1,510,775	$992,791	$22,100,480
1/1/05	$22,100,480	$1,547,034	$1,016,618	$22,630,896
1/1/06	$22,630,896	$1,584,163	$1,041,017	$23,174,042
1/1/07	$23,174,042	$1,622,183	$1,066,001	$23,730,224
1-Jan	$23,730,224	$1,661,116	$1,091,586	$24,299,754
1/1/09	$24,299,754	$1,700,983	$1,117,784	$24,882,953
1/1/10	$24,882,953	$1,741,807	$1,144,611	$25,480,149
			$10,311,334	

Assumptions: Rate of return is 7.0% per year.
Inflation is 3% per year.
Surplus funds are withdrawn for other uses, primarily debt service.

An indirect benefit of its ability to issue debt, especially GO Bonds and the existence of the Permanent Fund, is the AEB's credibility with the State of Alaska when it seeks State participation in a project. It has been an evolving policy in the State of Alaska to fund projects which exhibit local financial involvement. The AEB is capable of doing so on this and other projects.

The attached spreadsheet illustrates how the AEB proposes to meet its financial commitment as the non federal sponsor on the Sand Point Boat Harbor project. It anticipates beginning construction in FFY 2000.

Sand Point Harbor Contribution

Activity	COE	STATE OF ALASKA	AEB GO BOND	AEB GF	AEB LONG TERM COE FINANCING	STATE OF ALASKA	REVENUE BOND	TOTAL
Year		2000	2000	2000		2001	2001	
GNF	$7,224		$903		$903			$9,030
Lands & Damages	$5		$125					$130
Total	$7,229		$1,028		$903			$9,160
Local Service Facilities								
Mooring Basin		$71	$22	$243		$1,050	$872	$2,258
Moorage Basin Dredging		$439						$439
E&D		$319						$319
Con. Mgt.		$286						$286
Total			$22	$243		$1,050	$872	$3,302
Grand total	$7,229	$1,115	$1,050	$243	$903	$1,050	$872	$12,462
Notes:								
	The above amounts are in $1,000s.							

Sand Point Harbor Proforma

Revenues	2001	2002	2003	2004	2005	2006	2007	2008
Permanent Moorage	$113,442	$113,442	$113,442	$113,442	$119,114	$119,114	$119,114	$119,114
Transient Moorage	$142,894	$142,894	$142,894	$142,894	$150,039	$150,038	$150,038	$150,038
Total Revenues	$256,336	$256,336	$256,336	$256,336	$269,153	$269,152	$269,152	$269,152
Expenditures								
Salary	$40,000	$41,200	$42,436	$43,709	$45,020	$46,371	$47,762	$49,195
Fringe	$6,000	$6,180	$6,365	$6,556	$6,753	$6,956	$7,164	$7,379
Travel/Per Diem	$2,000	$2,060	$2,122	$2,185	$2,251	$2,319	$2,388	$2,460
Telephone	$1,000	$1,030	$1,061	$1,093	$1,126	$1,159	$1,194	$1,230
Supplies	$2,000	$2,060	$2,122	$2,185	$2,251	$2,319	$2,388	$2,460
Insurance	$10,000	$10,300	$10,609	$10,927	$11,255	$11,593	$11,941	$12,299
Utilities	$10,000	$10,300	$10,609	$10,927	$11,255	$11,593	$11,941	$12,299
Major Repairs	$27,400	$27,400	$27,400	$27,400	$27,400	$27,400	$27,400	$27,400
Debt Service	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000
Total Expenditures	$248,400	$250,530	$252,724	$254,984	$257,311	$259,708	$262,178	$264,721
Ending Balance	$7,936	$5,806	$3,612	$1,352	$11,842	$9,444	$6,974	$4,431

Sand Point Harbor Proforma

Revenues	2009	2010	2011	2012	2013	2014	2015
Permanent Moorage	$119,114	$125,070	$125,070	$125,070	$125,070	$125,070	$131,324
Transient Moorage	$150,038	$157,540	$157,540	$157,540	$157,540	$157,540	$165,417
Total Revenues	$269,152	$282,610	$282,610	$282,610	$282,610	$282,610	$296,741
Expenditures							
Salary	$50,671	$52,191	$53,757	$55,369	$57,030	$58,741	$60,504
Fringe	$7,601	$7,829	$8,063	$8,305	$8,555	$8,811	$9,076
Travel/Per Diem	$2,534	$2,610	$2,688	$2,768	$2,852	$2,937	$3,025
Telephone	$1,267	$1,305	$1,344	$1,384	$1,426	$1,469	$1,513
Supplies	$2,534	$2,610	$2,688	$2,768	$2,852	$2,937	$3,025
Insurance	$12,668	$13,048	$13,439	$13,842	$14,258	$14,685	$15,126
Utilities	$12,668	$13,048	$13,439	$13,842	$14,258	$14,685	$15,126
Major Repairs	$27,400	$27,400	$27,400	$27,400	$27,400	$27,400	$27,400
Debt Service	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000
Total Expenditures	$267,341	$270,039	$272,818	$275,681	$278,629	$281,666	$284,794
Ending Balance	$1,811	$12,571	$9,792	$6,929	$3,981	$944	$11,947

Assumptions:

Revenues

The moorage rates will be established to approximate those of the King Cove Harbor.

The Borough and the City of Sand Point will operate the new harbor under a management agrements.

The Borough will raises the moorage rates every fifth year 5%.

Expenditures

The City will need to add only one new employee to its Harbor Department.

Expenditures will increase at an annual rate of 3% with the exception of major repairs and debt service.

Major repairs is the amount estimated by the COE to maintain the facilities.

Debt service will amortize a revenue bond over 15 years.

STATE OF ALASKA

TONY KNOWLES, GOVERNOR

DEPARTMENT OF TRANSPORTATION
AND PUBLIC FACILITIES

Division of Design and Engineering Services
Office of the State Harbors Engineer

3132 Channel Drive
Juneau, Alaska 99801
PHONE: (907) 465-3979
TEXT TELEPHONE: (907) 465-3652
FAX: (907) 586-8365

March 6, 1998

Mr. Robert S. Juettner,
Administrator, Aleutians East Borough
1600 A Street, Suite 103
Anchorage, Alaska 99501-5146

Dear Mr. Juettner:

The Department of Transportation and Public Facilities is pleased that the Harbor Improvements Feasibility Report and Environmental Assessment, Sand Point, Alaska is complete and has been recommended for construction by the District Engineer, US Army Corps of Engineers. The completion of this feasibility study and project milestone represents a successful partnership between the Corps of Engineers, the Alaska Department of Transportation and Public Facilities, the Aleutians East Borough and the City of Sand Point.

This office concurs with the conclusions that the construction of this harbor is technically possible, economically justified, and environmentally and socially acceptable. The technical recommendations are fully supported by our office. The opportunity to work on behalf of the Borough with the Alaska District study team has produced a well considered project proposal which we believe to be technically sound, functional and efficient.

The Department will support the City of Sand Point and the Aleutians East Borough in the development of the proposed harbor. The Department will provide immediate financial assistance up to $100,000 toward preliminary engineering and design (PED).

While continued State participation is subject to appropriations, the Department will support the project and your efforts in securing funding through that process. If I can be of further assistance, please do not hesitate to call.

Sincerely,

State Harbors Engineer

PETER PAN SEAFOODS, INC.

THE TENTH FLOOR
2200 SIXTH AVENUE
SEATTLE, WA 98121-1820
206.728.6000
OPERATION FAX 206.441.9090
SALES FAX 206.728.1855

February 26, 1998

Janis Kara, Project Manager
Civil Works Branch
U.S.Army Engineer District, Alaska
P.o. Box 898
Anchorage, Alaska 99506-0898

Re: Sand Point Harbor Improvements.

This is a letter of support for the improvements to the Sand Point Boat Harbor as presently designed.

These improvements will provide much needed protected moorage for the Salmon Tender fleet that Peter Pan Seafoods, Inc. uses annually. During the Salmon Season we use as many as 15 tenders to serve the needs of the Sand Point fishermen. These vessels range in size up to 140 feet in length, and some carry as much as 500,00 pounds of salmon at a load.

During the summer of 1997, we had an opportunity to review Boat Harbor Improvement plans with the Captains of our Tender Fleet. All agreed that the Alternative 1 Plan was desirable and the Captains of the larger vessels believe that the design will allow for sufficient maneuvering room to navigate the entrance without difficulty. All the Captains were enthused with the opportunity to moor their vessels during the various off-season periods as well as a safe harbor during the storms that frequent our area.

If I can be of further assistance, please call on me.

Rowland E. Davis
Plant Manager-Sand Point

O